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16,000 MILES OF FORESTED SHORE LINE

By E. A. STERLING

HE steamer on the Vancouver-Prince Rupert run covers about 550 miles. In this same distance there are about 16,000 miles of forested coast line on the two shores and around the islands of the inside channels. This is a distance appreciable only by comparison. If connected and straightened out it would give a shore line of magnificient forests and mountains two-thirds of the way around the world, or from New York via Cape Horn, past New Zealand and Australia and almost to the Cape of Good Hope, South Africa.

The passenger from the deck of an Alaska or Prince Rupert steamer on the inside route sees on this coast line a panorama of mountains and forests unequalled on any regular water course in the whole world. From the time the steamer swings out through the narrow entrance of Vancouver Harbor and on past Point Atkinson into the Strait of Georgia, a sky line of mountains and indented shores breaks the view on every side. A hundred miles north of Vancouver the wide sweep of water narrows into tide swept channels, and for 120 miles until Queen Charlotte Sound is reached, the ship is navigated through passages which might be enormous salt water rivers, except that now and then the channels widen or a Sound or Inlet gives a vista of miles of connecting water running back into the west slopes of the Cascade Mountains.

On one side the shore of Vancouver Island rises abruptly to a mountain chain of 3,000 to 5,000 feet, along the foot of which the boat passes; while

on the east is a broken shore line with thousands of large and small islands, and an intricate system of protected channels extending far back into the mainland. The far background is a wilderness of jagged mountains with ever-present snow-capped peaks and here and there the green hue of glacial ice. In the middle foreground of the shores the forests uniformly cover the lower slopes, save where the logging camps have taken their commercial toll. Evidences of man or civilization exist only in the occasional camps of loggers, salmon canneries and the Indian villages.

If the tourist from an ocean-going steamer on the regular course sees all this, and more, what is revealed to the cruising launch which threads the narrow channels and inside passages off the regular route? The steamer view shows an unparalleled view of mountains and glaciers, with the pointed, overhanging of Mt. Stephens peak a striking landmark; the independent cruising party sails at will through the unfrequented waters, and back fifty to one hundred miles up deep water inlets into the very heart of the mountains, and along the foot of the peaks and glaciers, as on Kingcome Inlet, which comprise the units of the distant view.

The tourist compares the west coast of British Columbia with the fjords of Norway; but anyone who gets the intimate view, attempts no comparisons, since the knowledge is given that no such magnificent combination of water and shore exists anywhere. To complete the picture, imagine a region

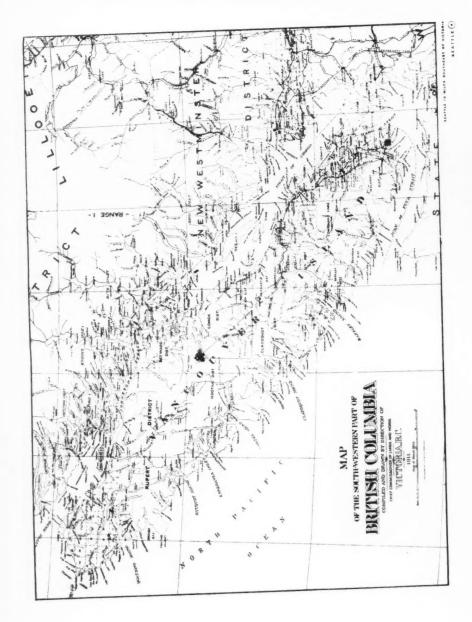




Photo by E. A. Sterling.

HOME OF A PROUD NIMKISH CHIEF.

NOTE THE SIGN OVER THE DOOR OF THIS CHIEF'S HOUSE, ALSO THE TOTEM PAINTED ON THE SIGN. ANOTHER CHIEF IN THE SAME VILLAGE HAD A SIGN READING:

CHIEF JOHN CLARK OF TIAWSIS GAVE A FEAST. 1,130 SACKS OF FLOUR—COST \$2,260.00 SEPTEMBER 18TH, 1911

where your cruising launch can nose its way half a dozen times a day into Sounds and Inlets where you have a water setting comparable to the Lake of Lucerne with a Riga above every headland. And if you miss the art and history developed by the people of the Swiss Mountains, remember that you can go ashore in colonnades of trees which were fully mature when the old bridge at Lucerne was built, and more beautiful than any cathedral; and in the Indian Villages find traits and customs unchanged from the time of the Lake dwellers of Como.

The Indians of the British Columbia coast are known generally as Siwash. Actually the term Siwash is not a tribal name, but a term of derision in the Chinook jargon. The traits which give rise to the name probably resulted in part from contact with the whites, although most of the tribes were never highly developed. There are 188 bands or tribes of Indians in British Columbia, with a total population of about 25,000,

of which a large per cent live on or adjacent to the coast.

These various bands are under the charge of regional government agencies, and under each agency are several bands. For example the Kwawkewlth Agency at Alert Bay has charge of Kwashela, Nimkish, Tsawataineuk and Mamalillikulla and various other bands, all belonging to the Kwawkewlth or Lachwiltach Nations. The population of these various bands varies from a dozen or two up to two or three hundred individuals.

While some of the old Indian traditions and customs are dying out, most of the tribes keep up some form of the potlach, which in the native tongue "Palth-piah" means the distribution of gifts. For example, "potlach conway sun nisika muck-a-muck," is a Chinook version of "Give us this day our daily bread," in the Lord's prayer. At the same time like most Chinook words it has a host of meanings which cover carnivals, feasts, meetings for trade and

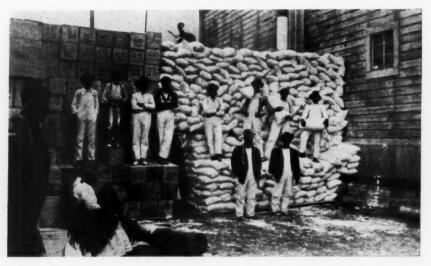


Photo by D. C. A. Galarneau.

SUPPLIES FOR A POTLACH.

ON THE LEFT ARE DOZENS OF BOXES OF SEA BISCUIT AND ON THE RIGHT SCORES OF BAGS OF FLOUR. THE DISTRIBUTED AMONG THE INDIANS AT A POTLACH GIVEN AT ALERT BAY, BRITISH COLUMBIA THESE WERE ALL

barter, and the various ramifications of the potlach.

The gifts at these "potlachs" consist of money, blankets, dishes, calicos and other articles and the amount of material given away at some of these carnivals is enormous. According to the lettered sign of Chief John Clark of Tiawsis a feast occurred at which 1,130 sacks of flour costing \$2,260 were used. Naturally the Indians will travel long distances to attend a potlach, and enjoy the dancing and singing as well as the gifts. The Kwawkewlth tribes probably rank first in the frequency and the extent of these festivals.

The "potlach" houses, which are large, barnlike structures built of cedar, may best be described as community affairs where the Indians trade, feast, frolic and entertain their friends. The houses are usually occupied between the ceremonies by poor Indian families who appropriate space wherever they can find it, making them free hotels in which they build open fires for warmth and for cooking, and to which they bring their food, blankets and fleas. The latter are permanent inhabitants of all these places.

The burial customs are unique, the chiefs and leading men being buried usually on little islands with quaintly carved totems and headboards; while

The principal art of the Indians is wood working, and a high degree of imaginative skill is shown in their totem poles. These poles are emblems or tokens of clans or of families and have no particular religious significance. While the Indians are proud of them it is the same sort of pride and reverence a family might have for its coat of arms, or family crest.

The poles are colored and often very cleverly, the predominant colors being red, yellow, green and black. Their size and form depend entirely upon the caprice of the man who makes them.

The native boats are really works of art, and from the war canoes 30 feet or more long, to the delicately carved lighter canoes, which seat only two or three, a balance and symmetry unattainable by white men is the rule. All. these boats are dugouts that are carved from a single cedar log, but so well is it done that many of the canoes are light and fast, and beautifully embellished at bow and stern.



Photo by E. A. Sterling.

A TYPICAL SIWASH TOTEM.

Note the great care given to detail in the carving of the large and small figures and in the decorative work at the top of the pole. These totems made by the Nimkish band of the Kwawkewith nation excel in many ways the work of the Alaska Indians.



Photo by E. A. Sterling.

AN ELABORATE TOTEM.

The variety expressed in these figures is worthy of particular attention. Note the head at the foot of the nearest pole and the hooded head at the top surmounted by the fantastic bird. All these poles are made of cedar.



Photo by C. A. Lyford.

A FULL LENGTH TOTEM.

This is a quite unusual full length totem of a human figure, the usua totem being a series of figures. It is about eighteen feet high and a good idea of the size may be gained from the six-foot man standing beside the left leg.

The lines on the forehead, cheeks, ears, eyes, mouth and finger tips are white, giving a strikingly grotesque appearance. This totem, the only one of the kind seen in B. C., is in the Tsawataineuk village of Gwayasdums.



Photo by E. A. Sterling.

A SIWASH DUG OUT.

Some of the British Columbia Indians are very skillful in the making of these "dug out" canoes, far excelling the white men. The canoes are light and graceful as may be seen. This one is manned by two Indian boys and can travel fast.

the lesser lights are laid to rest in a rude box tied fast to a limb high in the top of a nearby tree. In an isolated winter village of about 350 inhabitants on a little island near Fife Sound the trees back of the village are thickly laden with the rude burial cairns. Fish of various kinds largely constitute the Indians' diet, and at the same village the strip of beach is strewn with shells of clams which have been brought in until it looks like a natural shell beach.

As government wards, the Siwash are a race on which either pity or admiration would be wasted. They are well suited to their environment, and the British Columbia coast is something of a Paradise for the Indian temperament. They can hunt and fish in any season of the year, work in the canneries or logging camps if they feel like it and do not have to plan for any radical change in seasons. Their attire reflects the prosperity, age and tastes of the wearer, ranging down through various stages of overalls, calicos and blankets, to the old squaw with a dirty single garment, blanket, and bare feet. The young Indians are often seen

proudly and uncomfortably attired in the latest styles of ready-made clothes, with the accompaniment of shiny yellow shoes, white collars and other adjuncts of civilized man.

Some of the Indians are at times really very prosperous, their cash assets being derived from high pay as guides, or the more nominal wages of the salmon canneries; while a particularly energetic individual will sometimes appear in town with \$1,000 to \$3,000 in cash as the result of having sold a boom of hand logged timber. As a rule, however, they are poor more hours than they are rich. Naturally they do not know how to make the best use of their money when they get it, but they spend it according to the best light they have, which usually means that it goes for "jim-cracks" or a lot of first class material which they really do not need.

A well-known forest engineer in Vancouver relates his experience in spending an evening at one of the Indian homes at Thunder Bay. Apparently the family had recently passed through a temporary period of prosperity, for the visitor was interested to see stacked up

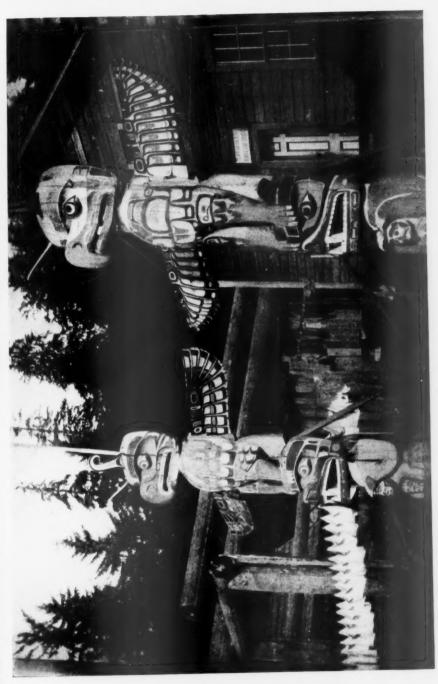


Photo by E. A. Sterling.

TOTEMS AT ALERT BAY , B. C.

THESE TOTEMS ARE ERECTED IN FRONT OF THE HOUSE OF A TRIBAL CHIEF WHOSE NAME IS PROMINENTLY DISPLAYED ON A SIGN ABOVE HIS DOOR. ON THE LEFT IS THE FRAME OF A POLIACH HOUSE. THE CLOTHES LINE AT THE LEFT DOES NOT HOLD THE FAMILY WASH, BUT FISH HUNG OUT TO DRY



Photo by D. C. A. Galarneau.

DUG OUT MADE BY WHITE MEN.

TIMBER CRUISERS USING A RED CEDAR "DUG OUT" MADE BY WHITE MEN. IT IS HEAVY AND CLUMSY COMPARED WITH THE DUG OUTS MADE BY THE INDIANS, WHO ARE ADEPTS IN WOOD CARVING, EVEN WITH THEIR CRUDE TOOLS.

at one end of the room 40 pairs of trousers and as many coats, shirts and other articles of wearing apparel, and miscellaneous clothing without end. The collection also included dozens of crates of oranges, canned fruits and vegetables, several phonographs and a fine \$85 steel range which they used for a sideboard. Yet with all this luxury they cooked their food over an open fire inside the house and slept in quilts and blankets wherever they could find an odd place to lay them down at one end of the room.

The forests flanking the 16,000 miles of coast line are the most valuable resource of the region. The fish, game, minerals and scenery are resources of great interest and value; but the timber, under present developments, is a greater asset than all the others combined. The salmon canneries represent a well-established industry; mining is carried on in the region, but is not a ranking industry on the coast; while the game and scenery are not sought for themselves alone. Some day a steamship company may make capital of this scenic coast line, and Bute Inlet and Wakeman Sound be-

come as well known as Lake Louise or Banff, while with the increase in population in the Northwest, the inside channels of British Columbia may become a mecca for motor boat cruising, with summer houses on the coast and islands. Whatever the ultimate developments, the next decade at least will be a period of timber exploitation on an enormous scale and under fundamentally favorable conditions.

The west coast of British Columbia is an enormous natural forest region where the favorable conditions for growth have produced dense forests of valuable species at once protected from the winds of the Pacific, and immediately accessible to tide water. heavy rainfall of from 60 to 120 inches annually is a decided factor in producing the large individual trees in heavy stands, and at the same time has prevented wide destruction by fire. other factor which has favored timber growth and prevented fire is the proximity of the warm Japan current, which causes heavy fog during parts of the year. This "Queen Charlotte fog belt" extends over a large section of

the coast timber country, and keeps some of the best timber protected in a blanket of moisture, as are the redwoods on the California coast. The coast region is almost entirely nonagricultural, and should be kept under forest cover. This is fortunately a future likely to be realized under the Provincial policy of fire protection, aided by the heavy rainfall and the tendency of valuable species to reproduce naturally on cut over land.

The predominating commercial species of the coast forest are Douglas fir, red cedar, hemlock, balsam and spruce. The estimate of the timber in British Columbia is 250 to 300 billion feet, of which a large percentage of the best and most accessible is on or adjacent to the coast. The Province of British Columbia derives a large part of its revenue from its forests; the amount collected in 1913 from royalties, license fees and other sources amounting to nearly \$3,000,000, or an average of approximately \$7 for every inhabitant of the Province. Of this about \$245,000 was used during the same year by the Forest Branch for the management and protection of the forests, the heaviest

expenditures for fire protection being in the mountain districts. Government launches and their crews maintain a fire prevention and police patrol on the 16,-000 miles of forested shore lines.

While these shores appear to be heavily forested, an entirely wrong impression of the uniform value and similar character of the forests is derived from casual observation by travelers, or even by timbermen who draw their con-clusions from a boat trip. The forest cover is practically complete and fairly uniform, but a large amount of the timber is not of merchantable value under present market conditions, nor likely to be, until the better timber equally accessible is exhausted. The timber of value for present logging, or to hold as an investment, does not cover the whole shore line, but lies in the protected "draws" or valley bottoms where little streams break into the "salt chuck," or on moist slopes. The investor who buys timber limits just because they have trees on them is in for a long wait or an unhappy awakening. It is very unsafe to "cruise" British Columbia timber from a boat.

Startling as it may seem, probably not



Photo by E. A. Sterling.

BRITISH COLUMBIA COAST SCENE.

THIS IS A TYPICAL VIEW IN ONE OF THE NUMEROUS INSIDE CHANNELS AMONG THE ISLANDS ALONG THE COAST OF BRITISH COLUMBIA.



Photo by E. A. Sterling.

WHAT A FORESTER NEEDS HERE.

IN CRUISING TIMBER IN THE COAST DISTRICT OF BRITISH COLUMBIA A LAUNCH IS ABSOLUTELY ESSENTIAL AND IT MUST BE SEAWORTHY. HERE IS SHOWN A FORESTER'S LAUNCH AT ANCHOR IN THE PROTECTED WATERS OF A LAGOON.

over 10 billion feet of British Columbia's 300 billion feet of timber is of high grade and immediately accessible to tide water. Since timber of this character, available for cheap logging and water transportation is in greatest demand, it is also of highest value. By the same token, such timber so long as available becomes a basis of values, and since it can be logged cheaply keeps the price of manufactured lumber at low levels. This condition, however, cannot last long, since the quantity of such timber is so distinctly limited. Part of it is being cut each year and part held for better prices. Gradually the supply of logs has to come from farther north, or farther inland, and from land not quite so cheaply logged, so that while the quantity may be as good, the costs of production generally are rising, and thereby increasing the stumpage value of the highgrade tide-water timber still uncut.

The kind and character of the timber varies considerably in the coast region. Douglas spruce for about 100 miles north of Vancouver is the most abundant species, and in greatest demand and of highest value. It reaches magnificent proportions in individual trees,

the larger specimens often measuring 8 to 10 feet in diameter, with a volume of 15,000 feet or over per tree.

North of the region where Douglas spruce is predominant is an enormous stretch of inside water and shore lines known as the "cedar country." Here occurs red cedar in its optimum development. In favorable locations are found stands of cedar made up of trees from 4 to 10 feet in diameter, of the finest quality, and in quantity occasionally running over 100,000 feet to the acre on considerable areas. Over many square miles cedar will comprise 50 to 80% of the stand.

Red cedar ranks with southern cypress as the "wood eternal." Perfectly sound logs are taken from fallen trees, which are known by the age of trees growing over them to have lain in the wood for a hundred years and more. Since the wood is very resistant to decay, cedar is widely used for poles and shingles. It is also an excellent building material where great strength is not required, and in texture and firmness of grain is almost unequalled.

Alone or associated with other species on the whole west coast is found



Photo by C. A. Lyford.

THE WRITER OF THIS ARTICLE AT THE FOOT OF A RED CEDAR.

Photographs give inadequate conception of the character of the forests. The actual ground level in this picture was several feet below the apparent base of the tree, and the thick undergrowth made it difficult to get a clear view. So dense is the forest cover that it is necessary to give one to one and one-half minutes' expesure for a picture.



Photo by E. A. Sterling.

OVER 20,000 BOARD FEET IN THIS.

This magnificent product of the forest, whose diameter is about nine feet, is a douglas fir. $Many_A$ such trees will cut 10,000 to 20,000 board feet. The rough root-like growth in the trunk is not part of the tree.

spruce, hemlock and balsam. Spruce is the least abundant, but of the highest value of the three. The other two are woods of the future, the present market absorbing only limited quantities of the lumber. This, however, is only because of the abundance of other woods which received earlier recognition. The western hemlock is far superior to the eastern species and suitable for many purposes as construction material, while balsam, although less strong, is equal in other respects and has the advantage of lighter color and more uniform texture. Both balsam and hemlock are extensively utilized in making paper pulp, and while their present lumber value is

not great, their low stumpage value makes them an attractive and promising investment. A \$5,000,000 paper mill at Powell River, with a capacity of 225 tons of paper per day, uses spruce and hemlock almost exclusively for pulp. They also use considerable balsam and like it.

Logging on this entire stretch of coast line is naturally one of the largest and most interesting phases of the timber exploitation in the region. Its beginning was near the early centers of settlement, and it is now developed and extended far up the coast. In advance of the present operations were the "hand loggers," a peculiar development



Photo by E. A. Sterling.

BRITISH COLUMBIA DOUGLAS FIR.

DOUGLAS FIR IS ONE OF THE MOST VALUABLE WOODS IN BRITISH COLUMBIA. THIS STAND IS IN A MIXED FOREST OF FIR, HEMLOCK AND BALSAM.

of local land laws and markets. In a word, under the earlier laws any citizen of the Province could take out a license for hand logging, which gave permission to log on a stated area which was always immediately adjacent to tidewater. The provisions of the permit were that no steam machinery should be used. The payment for this permit was only a few dollars, and the result was that many men in pairs or small camps operated close to the shore line, felling the larger and better trees, and by an amount of labor and skill almost incredible, slowly worked the logs down into the "salt chuck." These would ultimately be assembled into booms and towed to the mill. The result is that the shore line is scarred for miles by the work of these hand loggers, but under present market conditions the land can be logged over again, while the strip operated on is so narrow that it really has little effect on the value of a timber

Present logging operations on tidewater limits are conducted almost entirely with heavy equipment which consists of a "bull" donkey located on the shore line with a skid road running back a convenient gully or ravine for 1,200 to 3,000 feet or more. Smaller skidding donkevs mounted on heavy frames pull themselves through the woods and after the trees are felled, skid the logs to the main road where they are hauled by steel cables to tidewater by the larger donkey at the shore. The size of the logs and the rough nature of the ground prevents the use of draft animals or the lighter equipment seen in the south and The logs are assembled in protected coves or bays and made up into booms which are then towed by large tugs to the sawmills at Vancouver, New Westminister and other points. charges for towing vary with the distance. The present logging rates range from 75 cents a thousand to as high as \$2.50 from Seymour Inlet, which is 250 The towing miles from Vancouver. charge for most of the inside channel country is from \$1.00 to \$1.50 per thousand. In the coast district logging and towing can be carried on the year round. although usually most of the camps shut

down during the winter season, which is the period when it rains a little harder, if possible, than during the spring and summer. There is, however, little or no snow.

The booming of logs in the coast district of British Columbia is an intensively interesting phase of the lumber industry. The usual type of boom is made up of 8 to 12 sections or "swifters," each section being made of boom sticks 64 feet long and a top diameter of 12 to 16 inches fastened together with heavy chains. Having secured the boom sticks together, they are placed in two parallel lines and the logs floated in and arranged endwise, packing them as closely as possible to the desired width of the boom, which varies from 60 to 100 feet. Care is taken to place comparatively long logs next to the boom sticks where they are joined together. After filling the boom with logs, the boom sticks are drawn together by a winch or small donkey engine, and the binding poles or "swifters" to hold the boom from spreading, are placed in position and chained at each end to the boom sticks. A single section or "swifter" of a boom usually contains from 40 to 80 thousand feet log scale, and while 8 to 12 sections is the usual number, as high as 20 sections or over a million feet are sometimes made into one boom. Booms of this character are known as water section booms and their towing speed is from 2 to 21/2 miles per hour, and frequently the larger tugs tow several booms. There is comparatively little loss to logs thus towed when navigating the waters between Vancouver Island and the mainland, but since a gale is a source of danger, it is usual for the captain to seek shelter upon indication of a storm. There is no particular period of gales or hurricanes, however.

Another form of boom which has come into favor is known as the Davis patent. Its essential features consist of arranging a sufficient number of long logs to made a width of 80 to 100 feet. These logs are then firmly bound together by a wire cable at each end. Other logs are then piled on top and as the weight increases, the raft forming the bottom



Photo by E. A. Sterling.

HEAVY STAND OF HEMLOCK AND BALSAM.

Trees with clear length of 200 feet, and stands of over 100,000 board feet per acre, are not uncommon in these forests of hemlock and balsam. The undergrowth is often luxurious as in a tropical forest. This particular stand was on a slope immediately adjacent to tide water.



Preparing a Boom.

HERE THE BIG LOGS ARE BEING ASSEMBLED AND WILL LATER BE MADE INTO A BOOM AND TOWED DOWN
THE COAST TO THE SAW MILLS.

sinks. This process is continued until the logs form a rounded pile extending 10 or 12 feet above the water-line and for a considerable distance below. Cables are then passed over at each end from the outside log of the original raft to the corresponding log on the other side and firmly secured. The raft when finished resembles a great sheath of grain, except it is bound at both ends instead of the middle. From 400 to 800 thousand board feet can be towed in a single section of this kind and without danger of loss from storm. This form of rafting is especially valuable for hemlock, which shows a tendency to sink. If the front end of a hemlock log in a water section boom dips down ever so slightly when in motion, the downward thrust of the water will force it out of place, and after turning a somersault under the boom, it simply rolls out and is free.

The future of this great tidewater timber country, and, in fact, of all the British Columbia forest lands, is of particular interest to the forester and conservationist. Since so much of the

country is non-agricultural, it is fundamentally suited for continual forest production. Natural growth and controllable fire risk encourage this end. Such use of the territory assures not only a permanent asset to the Province, but a reserve timber supply which, because of its availability to water transportation, will be distributed among the markets of the world. The first step is the utilization of the existing forests since the trees are now over mature. The cutting will be incomplete and wasteful because the market permits utilization of only the best. Following this era of lumbering will come a long regeneration period, when the cut-over land, either naturally or with the help of man, will come back into forest. The second and successive forests will never equal the first because the market by then will not have the heritage of the trees centuries old to draw on, and will be content with smaller sizes and lower grades.

It is not without regret that these incomparable tidewater forests are consigned to the commercial needs of ad-



Photo by E. A. Sterling.

BRITISH COLUMBIA RED CEDAR.

THE TRUNKS OF THESE RED CEDARS ARE COVERED CHARACTERISTICALLY WITH MOSS. DESPITE THE ROUGH OUTSIDE APPEARANCE OF MANY OF THE CEDAR TREES, THEY PRODUCE LUMBER OF THE FINEST GRAIN AND TEXTURE.



Photo by E. A. Sterling.

NOW TIMBER-SOON TO BE PAPER.

A NINETY-FOOT HEMLOCK STICK ON ITS START THROUGH THE POWELL RIVER PULP AND PAPER MILL WHERE IT WILL BE CONVERTED INTO PAPER IN ROLLS FIFTEEN FEET WIDE.

vancing civilization from the new China and other countries of the Orient to the settlers of the Canadian West. Sentiment, however, will play little part and the greatest regret of foresters and lumbermen will be that the utilization cannot be more complete. It is inevitable, since the consumers demand only the best at the lowest price, that the producers can manufacture and market only the material on which there is a profit. On the British Columbia coast this means that the smaller and poorer timber is not used, and the lumbering methods are apparently wasteful while in reality that is only in keeping with economic conditions.

The forested coast district of Western British Columbia presents conditions in the way of land ownership and lumbering methods which practically preclude any possibility of long time forest management by private owners. There are essentially three separate divisions of the lumber business into stumpage ownership and logging, manufacturing by sawmills, and the sale of lumber. In British Columbia the title

to most of the forest land is vested in the Government, the exceptions being certain grants which include both land and timber. Since forestry practice is absolutely contingent on the ownership of the land, it follows that the responsibility for the future forest production in the region rests with the Government. The individual or corporation acquires title to stumpage through timber licenses and the payment of an annual license fee. The stumpage owner may or may not be the logger, although the two, except in case of stumpage investment, usually go together. The manufacturer or sawmill man may have no interest whatever in the stumpage or the logging, and, in turn, may shunt the sales end of the business to separate organizations, although naturally the larger sawmill concerns have their own sales organization, and in some cases own The essential point, howstumpage. ever, is that the Government is the land owner, and, as such, has a tremendous responsibility in the development of a policy and practice which will eventually devote these lands to their best use

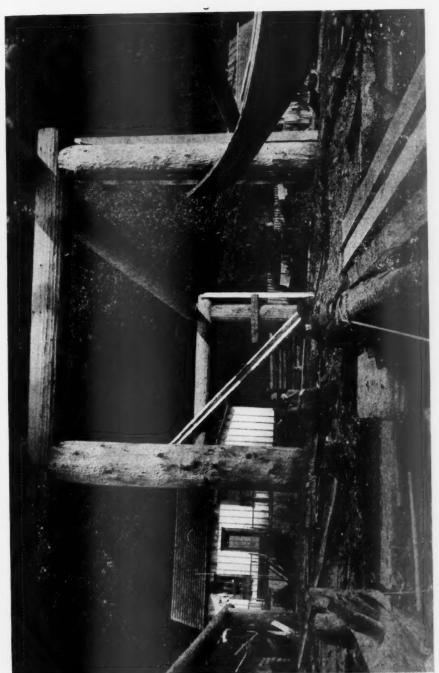


Photo by E. A. Sterling.

FRAME FOR A POTLACH HOUSE.

These are red cedar logs. The outside of the house will be of split cedar boards. The word "Potlach" in the Chinook jargon means "give," or the distribution of gifts at pollach gatherings, but as applied to the "potlach houses" is practically untranslatable. These houses are community affairs where trading is done, leasts given, etc. They are also used as residences by the poorer Indians, becoming free communal hotels.

-the production of successive forest

crops

The temporary or permanent inhabitants of these thousands of miles of forested shore line are almost exclusively interested in commercial developments. The region, however, cannot fail to make a deep impression; while the conditions are so varied, and the aspects so constantly changing, that even familiarity does not dull the attractions. The forest engineer, who was an entire stranger to the region less than ten years ago, has a variety of unique experiences entirely different from forest workers in any other sec-

tion of the country.

Since there are practically no means of transportation except by water, the forester depends on his cruising launch for transportation, and as a camp in much of the survey and exploration work on tidewater limits. As part of the day's work, he may find himself in the long northern twilight cruising down an inside channel over quiet water which reflects the dark forested shore line in an endless variety of shades and colors, while in the far distance the snow-capped peaks may still reflect the full sunlight or the saffron tints of the Alpine glow. At night he may anchor in a sheltered cove, dark and silent, save for the many sounds of the sea and wilderness, or cruise on under the deceptive light of stars or moon which makes familiar landmarks like strange and unknown sights. Most wonderful of all is a night run in a heavy fog when the moon above the fog bank lights the restricted view of water with a weird and ghostly radiance, giving the constant impression that the boat is turning in a narrow circle.

While these inside channels are usually calm and peaceful, the launch may run out of the sunshine into a

driving squall or from some protected passage into a veritable maelstrom of "white water," caused by a "tide rip" or the equalizing flow of the tides through some narrow channel. wind draws through some of the larger channels as through a chimney, and even moderate gales kick up a sea which means lashing everything fast and a round of pitching and rolling which is more spectacular than pleasant. such occasions the quiet, protected cove may not be within reach, and as night shuts down, the launch is glad to creep into partial protection along the shore or behind a boom of logs where the back wash makes the anchor chain a creaking, grinding nightmare and the night a mystery of strange sounds through long hours of anxious watching.

The forester's launch on one particular night, when a gale of rain was driving up Clatham Channel, had found snug refuge in a little cove protected by a boom of logs. Sharing the same shelter was a small, low-powered launch owned by a couple of loggers, who came aboard late in the evening loaded with a strong nerve tonic in the form of "Canadian red rye." Despite warning of the danger they started their engine, and after a half hour's loud talking and maneuvering to get through the opening of the boom, put out into the driving gale and heavy sea of the main channel, with the brag that they would make their camp across Knight Inlet or drown. For a few minutes their light could be seen bobbing up and down, and then was gone in the rain and darkness. Whether they arrived or not the writer does not know, but probably they did, for something of their spirit, whether shown in wild recklessness or cool, sober judgment, has been a dominant factor in the development of this frontier coast.

No More Barbed Wire

Forest officers in Washington and Oregon plan to discontinue the use of barbed wire on their forests. This will affect their own pastures and public drift fences. They say barbed wire has no advantage over smooth wire, that it injures stock, and that it is more likely to be borne down by soft snow. Stockmen on the Ochoco forest, in Oregon, recently constructed drift fences of smooth wire, though with some misgivings; now they say they will never use barbed wire again.

THE ASSOCIATION'S EXHIBIT

EMBERS of the American Forestry Association, their friends, and all who are interested in forestry, all who love trees whether in great forest areas, woodlands, country estates, the garden or the street, are invited to visit the exhibit of the Association at the Grand Central Palace, New York City, May 20 to 30, during which period the Forest Products Exposition will be held.

This will be the same exhibit which the Association had at the Exposition in Chicago from May 1 to May 10 and which thousands of Chicagoans and others visited. Attendants will explain the work of the Association and distribute literature as well as tell of the value of the great educational work the Association is doing. The chief feature is the display of photographs showing

different phases of forestry, the cutting, logging, and marketing of mature trees, the protection of the forests from fire, insect and disease; the replanting of forest land; the instruction of forest students, with examples of the losses due to lack of scientific forest management—in short, every condition in the use, the development, the protection and the growing of trees.

A souvenir given to each visitor is a circular containing forest scenes in colors and this was eagerly sought and highly commended at Chicago. Copies of the magazine AMERICAN FORESTRY are also given away. It is especially desired that school teachers and children should visit the exhibit. It is to be on the second floor of the Grand Central Palace, near the middle of the hall.

WHAT IS A SHADE TREE WORTH?

OW many people know what a shade tree is worth? How many ever give a thought to its value? Its grateful shade is enjoyed, its beauty is appreciated, both in a general sense, but few perhaps ever stop to think of its actual cash value. Perhaps this is never brought home more forcibly to a man than when a shade tree in front of his residence, a tree of which he is proud, is damaged or destroyed. Then ask him its cash value. He is likely to measure it by his own sense of what the tree has meant to him. Not unnaturally he may declare the tree worth hundreds of dollars to him. He will tell you what is only too apparent, that it cannot be replaced at once for thousands of dollars. It will take years to grow a similar tree on the same spot.

It was somewhat startling to the people of Ann Arbor, Michigan, to learn from the recent report of their city engineer that the shade trees of the city are valued at \$290,000. This is over a quarter of a million dollars' worth of property which the average man might never consider in giving an estimate of

the city's wealth.

Prof. Filibert Roth, of the Forestry Department of the University of Michigan, was asked to give the valuation, and his report names this modest sum. For the purpose of estimating the value of the trees and shrubs owned by the city, it was assumed that trees stand two rods apart throughout the residence sections of the city. According to Professor Roth, a tree is worth \$10 when it is nicely established and is four inches in diameter at a point breast high. Figuring the compound interest at five per cent, this \$10 has grown into \$20 in only 18 years. All trees are figured on this basis, since hundreds of them might be rated at more than \$100 apiece. It is estimated that there are in Ann Arbor

at the present time, about 12,000 shade trees which measure six inches in diameter, besides over 2,000 smaller trees set out in the last fifteen years.

In discussing his report Professor

Roth says:

"Why, as a matter of business, it may be said that these trees could not be replaced for this sum of money. A shade tree grows in value up to a certain time, then remains stationary in value for many years, and after that declines. But until it is a good tree and really does the service expected, it is fair to charge cost and interest to the tree. Generally a tree is over twenty-five years old bfore it is a serviceable shade tree and 'pays its way.' If it is worth \$10 when it is five years old it is worth \$20 at the end of twenty-five years. From the standpoint of city beautification and considering the enjoyment people get out of them, good shade trees are worth \$100 apiece. This is the valuation placed on trees by the city of Springfield, Massachusetts."

SAVE THIS FOREST LAND

GREAT deal of enthusiasm was manifested at the recent meeting of the Minnesota State Forestry Association at St. Paul in the plans for a campaign to be conducted all summer for an amendment which will come before the people next November at the general election. The State of Minnesota at the present time owns about three million acres of land and under the provisions of the Constitution this land is to be sold. The forestry amendment provides that all such land which is better suited for tree growth than for farming shall be set aside to be used as State Forests. This would give the State perhaps one million acres of forest land, to be managed according to forestry principles, and this would be the beginning of a real forestry policy for Minnesota.

It is naturally of great interest to all concerned that this amendment pass. It would really be a corner-stone, as it were, in the forestry development of Minnesota. If these one million acres will be retained as State Forests, the State Forest Service can go ahead and show lumber corporations that forestry really is practical, and if the State Service is given the opportunity to show what really can be done with reforestation and forest management, the time

will not be far off when the State will branch out on a large forest policy.

The time has come when Minnesota has to recognize the necessity of the management of its forests. Although there are still approximately seventyfive billion feet of merchantable timber standing in the woods, the people at large appreciate the fact that the proper management of timber lands is of vital concern. The annual value of the timber crop of Minnesota is fifty million dollars. It takes forty thousand horses to move this crop and three hundred thousand men to log, haul and manufacture it. The lumber industry is the second largest in the State, and one-third of the total output of Minnesota's farm produce is consumed by those in the lumber industry. Minnesota is the largest lumber producing State east of the Rockies, and with proper forest management, could increase its timber production four times, which would mean millions of dollars to the State annually.

The forestry amendment will be the entering wedge toward the proper management of the forest soils of Minnesota, and every endeavor will be made to make the people realize its importance.

Loss By Mistletoe

Mistletoe thrives on the western coasts to an extent not approached in the east. In many places this parasitic growth is responsible, directly or indirectly, for a considerable loss of timber.



ELK ARRIVING AT ITASCA STATE PARK.

THIS CARLOAD OF ELK WAS SHIPPED FROM JACKSON HOLE, WYOMING, TO ITASCA PARK IN MINNESOTA AND WILL BE USED TO STOCK THE PARK.

STATE FOREST AS GAME PRESERVE

By ERNEST O. BUHLER

HE arrival at Itasca Park, Minnesota, of a carload of elk from Jackson Hole, Wyoming, marks the beginning of a plan under which, it is hoped, these magnificent animals will be restored to the Minnesota forests in something like their former numbers. Once they roamed over Minnesota's wilds by thousands. But the hunter's rifle reduced them year after year, until there was danger that they would soon be added to the list of extinct animals.

Then the Yellowstone Park came to the rescue. To it the remaining elk gathered from the mountain ranges around, and there—amid just such an environment of forest, lake, meadow, swamp and snow-capped mountains as was most favorable for their multiplication—they have bred in such numbers that the Government has recently deemed the time ripe for their distribu-

tion among such States as would provide for them the necessary protection in a forest refuge.

State Forester W. T. Cox, of Minnesota, saw the value of the opportunity, and Itasca Park offered an ideal spot for a refuge. It was only necessary to surround with an eight-foot wire fence an area about a mile square, timber land, meadow and lake, and the refuge was ready.

The elk were very wild and difficult to catch, but a deep snow, while hindering their rapid flight, made it possible to tire them out by a persistent pursuit on snowshoes, and capture them by the use of the lasso. From Jackson Hole, where Howard Eaton obtained them, they were hauled over the rugged Teton Mountains to Victor, Idaho; thence they were taken by rail to Butte, to Wadena, to Park Rapids and Itasca State Park. While being driven through Teton Pass,



INSIDE THE PARK.

THE ELK TOOK TO THEIR NEW SURROUNDINGS AS IF TO THE MANNER BORN AND ARE NOW THRIVING AND CONTENTED.

one of the bulls became infuriated and, charging a helpless female, pushed her over a precipice into a canyon, hundreds of feet below. This was the only tragedy of the journey.

As the herd at Itasca Park grows larger—and the Government's experience shows that the animals multiply very rapidly—the plan is to distribute them among different State Forests in various parts of Minnesota. "But where are those forests?" the reader

may ask. The answer is, "There are practically none as yet." Whether such forests shall be created, and whether the beautiful creatures of the wild shall inhabit them, depends on the action to be taken on the forestry amendment to the State Constitution, next November, the adoption of which amendment will permit the use of waste and non-agricultural land for the growing of timber and the harboring of game.

EXAMPLE OF FIRE PROTECTION

By JACK GUYTON

HE actual saving of timber from destruction by fire which may be effected by a local organization is well illustrated by the work of the Coos County Fire Patrol Association of Oregon. This was the first county fire-fighting body in the State and since its organization and successful operation timber owners of twelve or fifteen other counties in the State have copied the plan and formed county associations along the same lines.

The Coos County Association was organized in 1910. W. J. Conrad is the secretary, and he devotes his time to arranging and carrying into execution plans for saving the timber. Before this organization existed sometimes as high as 10,000,000 feet of timber would be burned in the county in a season. Individual owners fought fires but in an unsystematic manner. Last year there was no loss of timber by fire, due to the work of the county association. This is on the theory of reducing the fire

hazard to the minimum and immediately fighting any fires that start.

In 1912 the membership included 41 big timber owners. Now the membership numbers 209 timber owners representing 383,392 acres of timber land. making up the richest natural resource in the county. Those owning small tracts of timber have found it to their advantage to join the association as well as the owners of the big tracts. The State law now provides that owners of timber must maintain a patrol during the danger season. If they do not, the State patrols the timber and charges five cents an acre, which is collected like any other tax. When a timber owner joins the association he meets the requirements of the law and the cost is much less than where he attempts a patrol himself, and the work is much more thorough when done by the association. Last season an assessment of one cent an acre was made and most of this money was used in preventive steps.

The association has built and maintains about 90 miles of telephone lines which connect with the farmers' companies and with the regular lines. Secretary Conrad has his headquarters in Marshfield and can keep in constant touch with the wardens located in different parts of the county. Trails have been built to the isolated localities and make it easier to reach danger points when fires start. The telephones have done much to send warnings to headquarters and allow prompt work in sending assistance to wardens when it is needed.

The field work is in charge of a chief warden and during the past season about twenty-five deputy wardens were kept in the field while extra men were in readiness to fight fires should they be needed. Slashing is done by the association and fire traps burned out so that when the danger season comes each year there is not much chance for fires to get a start.

The association has done much to educate the farmers as to fire danger. The farmers in the timber districts are allowed to use the association telephones for their own purposes and in consideration of this favor are asked to report promptly any forest fires they may see.

Secretary Conrad has conducted educational work in the country schools and has otherwise taught the people of the rural districts that it is to their interest to help the timber owners to protect against fire.

The county organization works in conjunction with the State Forestry Board in the protection work. The cost of fire protection through membership in the county association has been at a lower cost than any of the timber owners could have individually done the same work, and, moreover, it has been more effective. Hundreds of thousands of dollars' worth of timber has been saved from destruction by fire during the four years that the organization has existed. The work planned for the coming season will make the danger of loss of timber by fire in Coos County still less

Large Sale of Alaskan Timber

Arrangements have just been made for the sale of 40 million feet of timber on the Tongass national forest in Alaska. This forest is cut up by bays and inlets, some of which give an opportunity for taking the timber from the mill to the decks of ocean-going steamers. The Tongass forest is now self-supporting, its lumber product being used largely in local industries, much going into boxes for canned salmon.

Chestnut Trees Again Affected

California State inspectors at San Francisco have found a new canker disease on chestnut trees recently imported from Japan. According to Dr. Haven Metcalf, the Government's expert on such diseases, this appears to be of the same type as the chestnut blight which is ravaging the forests of the eastern United States, and it is possible that the new disease would be equally as destructive if it became established in this country.

THE GRAND COULEE

By WINTHROP P. HAYNES

N the heart of the vast lava plains which occupy a large part of the States of Washington, Idaho and Oregon,, lies the Grand Coulee, an unsurpassed natural feature of grandeur and wild beauty, which is well worthy of a place among the wonder sights of America, but which is practically unknown and unvisited at the present time.

The Grand Coulee is a great dry gorge or canyon cut by the Columbia river when it was diverted from its course ages ago in the glacial period, by an obstruction of ice, and made this channel across the lava plains in central Washington, in a general southwest direction. It extends nearly one hundred miles across a part of the so-called "Big Bend' region of the Columbia River, where the river turns west, then south and east, before making its final swing to the west which it holds to the sea. The Big Bend region is bounded on the north and west by mountainous areas.

The name "Coulee" is frequently applied all through this part of the country to any dry gully or canyon where water may flow during a small part of the year. In the Big Bend district there are many coulees, but the largest and most interesting is the Grand Coulee.

The northern part of the Grand Coulee extends for about thirty miles from the Columbia River to just south of Coulee City. This portion may be called the Upper Coulee, since it lies at a higher level than any of the coulees farther south. This Upper Coulee is a flat-bottomed, vertical-walled canyon, with several small lakes, some alkaline, along the western margin, which is prevailingly low and marshy. The depth of the floor below the level of the plains is from 400 to 500 feet, and the average width is about one and a half miles, but the coulee is very much wider in the vicinity of Steamboat Rock, a flattopped mesa ten miles south of the Columbia River, which rises about 400 feet

above the floor of the Coulee. The eastern wall dies out about five miles north of Coulee City, and the level floor rises and merges with the slightly undulating plain which extends eastward for many miles. The western wall, although somewhat broken and eroded back about three miles southwest of the town, continues for about twenty miles to the

south in the Lower Coulee.

There is a precipitous drop of about 400 feet in the floor of the Coulee four miles southwest of the town, and the top of the east wall in the Lower Coulee is continuous with the floor of the Upper Coulee. The floor of the Lower Coulee is uneven, and most of the depressions are occupied by lakes which are fresh in the northern part and strongly alkaline in the southern part of the Coulee. The walls of the Lower Coulee south of Moses Lake become less distinct, but the course of the former drainage channel is still clearly visible as it swings to the west and finally joins the Columbia River. The length of the Lower Coulee is about seventy miles.

GEOLOGIC HISTORY OF THE REGION

Many ages ago there was great volcanic activity in this region, and extensive flows of basaltic lava were poured forth and covered the rather subdued old land surface of the Big Bend to a varying depth. In the northern part the cover is relatively thin, and the granite of the old land surface is often exposed, but to the south it becomes increasingly thicker.

Following the volcanic activity the region was irregularly uplifted, causing dislocations of the lava flows and a warping of the surface. After a long period of erosion in which the region was nearly reduced to a plain, the land was again uplifted and the main streams had cut deep channels before the Glacial Period commenced. In the Glacial Period an ice sheet advanced down the



HERE HUNDREDS OF YEARS AGO A GREAT CATARACT POURED OVER THE CLIFF WHICH IS OVER FOUR HUNDRED FEET HIGH. THIS CLIFF NOW SEPARATES THE UPPER FROM THE LOWER COULED. IT IS ONE OF THE FIRST SIGHTS WHICH THE VISITOR IS DIRECTED TO SEE.

valley of the Okanogan River and extended across the gorge of the Columbia River. This ice dam caused the waters of the Columbia to flood the tributary valleys, and they rose until a low place in the divide was reached, south of the present site of Coulee City. Here they overflowed into the headwaters of a southwestward flowing tributary, and thus reached the channel of the Columbia River again. The divide was cut back and a great waterfall was developed, which must have been the equal of our grandest waterfalls now in existence. As the ice barrier melted away the waters of the Columbia were allowed to resume their former course, leaving the Grand Coulee, with its numerous lakes and springs as evidence of the temporary, pre-historic, crosscountry water channel.

This enormous dry canyon with its numerous beautiful lakes, and its site of a great prehistoric waterfall, which was as high as the Victoria Falls of the Zambesi River in Africa, and of much greater extent, may be easily visited by any tourists traveling over the Northern Pacific Railway, by leaving the main line at Spokane, and traveling over the branch line for 125 miles to Coulee City, which is a small town with good accommodations for guests, situated on the level floor of the Upper Coulee at a most advantageous spot to take in most of the interesting and grand views. The trip westward from Spokane is interesting and gives one a chance to see how this section of the country is being de-

veloped.

Soon after leaving Spokane we passed through cuts in gravel terraces and crossed a deep, flat-floored valley in which a very small stream is now flowing. This is evidently a channel cut by a large river in the Glacial Period, but now abandoned. The flat floor of the valley is now covered with small farms. After passing through pine-covered, hilly country, and traversing a gorge in the basaltic lava we reached the prosperous town of Cheney, situated in a farming district in low rolling country. Continuing westward we saw many fields of oats on the flats, while pine-covered hills interrupt the general level of the coun-

try. We passed through a belt of pines between Medical Lake and Deep Creek, and then abruptly left them for a rolling, treeless country covered with wheat fields that stretch to the horizon on either side of the track. Most of the farms depend on windmills to pump their water, which is generally obtained from a slight depth by driven wells. We passed through Davenport and Rocklyn and were still in a rich wheat section. The country here began to flatten out, and we saw the lava outcropping, and forming small mesas, and entered a level region of sage brush and bunch grass, with a few nearly dry lakes, with little grazing for cattle and horses and no agricultural development. After a few miles of this we got into more hilly country with scattered pines, and an occasional granite knob projecting through the basalt. Then we entered rolling open country, another great wheat-raising section. Shortly beyond the town of Creston we got a view of the mountains north of the Columbia River. Near Wilbur we entered level country again and saw a small coulee, which runs parallel with the track for some distance. Near Govan a small stream flows in the coulee, and a fringe of trees grow along its banks, the first trees seen for some time. We passed through some more good wheat land about Almira and Hartline, and saw a combination harvester at work, drawn by about thirty horses. From Hartline we swung to the south and descended in a gentle grade about 350 feet to the town of Coulee City, situated at about 1,600 feet above sea level. As we approached the town we got a fine view of the great western wall, which stretches far to the north and south, and also saw how the east wall, about five miles north of the town, bends down and merges with the plain. From Coulee City as a headquarters we traveled by automobile, carriage, horseback or foot to the various points of interest about the Grand Coulee.

The first place we wanted to see was the site of the ancient cataract and waterfall, with its 400-440 foot wall which separates the Upper from the Lower Coulee. By driving or riding about



THIS VIEW SHOWS HOW MANY VEARS AGO THE LAKE WAS CONNECTED WITH ONE TWO MILES AWAY BY A STRETCH OF WATER BETWEEN THE TWO LINES OF CLIFES. THIS ANCIENT WATER COURSE IS NOW DRY. WHERE THE WATER'S ACTION IS APPARENT

four miles to the southwest of the town, over the nearly level floor of the Coulee, which is dotted with sage brush and basalt hummocks, past several farms with small orchards, the brink was reached and its western margin followed until a wonderful panorama was disclosed. Stretching to the eastward for about three miles was the serrate headwall of the Lower Coulee, with a large and small plunge pool lake lying at its foot, occupying hollows in the rock carved out by the falling waters which gradually wore the cliff back several miles up the Lower Coulee to this point during the time in the Glacial Period that the waters of the Columbia River with water from the melting ice were flowing in this high level channel. Different parts of the cliff have receded at different rates, and the plunge lakes lie in the deepest embayments, separated by a flat-topped remnant of the cliffs, which is partly fallen to pieces. The larger of these lakes is called Castle Lake, and is a beautiful sight as viewed from the top of the cliff. The basalt rock of the cliffs turns a rusty brown under the effects of the weather, and is frequently covered with orange or greenish-yellow lichens in great patches, so that the cliffs are generally bright

We continued along the road for about two miles more to the southwest and obtained a fine view down the Lower Coulee for several miles, and saw nearly the whole floor occupied by a chain of lakes, which are nearly con-The nearest lake was Blue Lake, and the next, partly hidden by a bend in the Coulee, is Alkali Lake. The west wall here has a height of nearly 900 feet, but the long talus slope which extends about half way up, makes the height seem less. The east wall is about half the height of the west wall. The fringe of vegetation about the shore of Blue Lake, and the farm with a fine orchard at the northern end of the lake added a touch of green, which made the scene one of great beauty and grandeur.

The road descends to the floor of the Lower Coulee from this lookout point, and if in a light wagon, or on horseback, or foot, it is possible to make the descent. The road is so very steep and has such sharp turns that it is not advisable to descend in an automobile. On reaching the bottom we went through the farm and fruit orchard to the shores of Blue Lake, and out on the lake in a boat and landed on some of the small islands. Later we went up to Castle Lake and the other small lakes near the foot of the fall, and traveled up a road to the east which leads past another small farm and into an eastern branch of the Lower Coulee.

This eastern branch of the Lower Coulee is in many respects the most interesting and beautiful, because it is comparatively narrow, and a large part of it is occupied by a long, narrow lake, which is bordered by vertical cliffs. The lake is called Deep Lake, and from the vertical walls and the absence of any beaches it must be very deep, although no measurements of its depth have been made so far as could be ascertained. It is possible to get out of this east branch at one place only, and that is on the south side, where a road has been made which rises through a notch in the wall and reaches the upper level, and then swings to the north past the head of the east branch around to Coulee City.

The Deep Lake branch of the Lower Coulee may be reached most easily by a walk or drive of about two miles to the south of Coulee City. This branch falls away gradually in a series of steps, with drops of from 15-50 feet, which must have caused beautiful cataracts when the water was flowing through here. A few small pools remain in the deeper hollows of the upper part of this chan-We swung to the east past the head of this branch, and then following along the southern brim soon came to a lookoff point from which we looked down upon Deep Lake, the surface of whose waters is about 425 feet below. The walls rise from the water in a vertical cliff for about 100 feet, and then



 $\label{eq:deep_Lake} \textbf{Deep Lake}.$ The surface of the water is 425 feet below the rock on which the man is standing. The lake is so deep that soundings could not be taken.



Another View of Deep Lake.

In the distance looms the great west wall barrier. The colors of this lake range from a peculiar emerald green to a deep bluish green.

recede in a series of great platforms, formed by the successive lava flows, to the upper level which forms the floor of the Upper Coulee, upon which the town is situated. The walls of this east branch of the Lower Coulee show columnar jointing particularly well.

Looking westward down the east branch we saw Deep Lake far below, like a winding river in a deep canyon. In the distance looms the great west wall barrier. The colors of Deep Lake vary greatly with the time of day, ranging from a peculiar emerald-green to a deep bluish-green, but the lake is always wonderful, and flanked by the varicolored basalt rock it forms a scene that should be preserved in color by some artist

We decided to take a day trip north, in the Upper Coulee, to Steamboat Rock, a distance of about 20 miles. On starting north from the town we saw perched on the top of the west wall a short distance back from the edge a great basalt block as large as a house, which was evidently transported a short distance and left by the ice sheet which spread over the western part of the Big Bend region. This was Pilot Rock, a landmark easily seen for many miles to the east. Five miles to the north the inclined lava beds of the east wall rise out of the plain and flatten out, forming the eastern wall, which has an average height of about 450 feet. We noted that the edges of the inclined lava beds are truncated by the present surface of the plain. This shows that after the warping and irregular uplift, the region was greatly eroded and worn down nearly to a plain before the final uplift to the present elevation. Going north on the flat floor of the Upper Coulee we passed a few long, narrow lakes lying in swampy depressions near the foot of the west wall. The lakes have a dense growth of rushes about their shores, and usually a fringe of white alkaline deposits, where the water has evaporated and left the salts held in solution. About ten miles to the north of the town the Upper Coulee makes a bend and we got our first view of Steamboat Rock, which looks like the hull of a great battleship floating toward us. The

Coulee narrows to a width of about a mile a short distance below the rock, and then widens out until in the vicinity of the rock it is between three and four miles across. Steamboat Rock is a mesa or table mountain of horizontal lava beds about 450 feet high and one and a half miles long by one mile wide. On the floor of the Coulee about a half mile north of the rock is a fine ranch, with an orchard and garden, where a stop for lunch was made. While resting in the shade of the numerous trees about this ranch we enjoyed a splendid view of the great mass of Steamboat Time permitting, we extended our trip ten miles, to the northern end of the Grand Coulee, where we looked down on the mighty Columbia River flowing in its deep gorge, which is now cut several hundred feet below the level of the floor of the Coulee. The Coulee north of Steamboat Rock narrows again and the floor becomes very uneven as the lava cover becomes thinner, and the old granite surface with its hollows and knobs is exposed. By ascending to the top of the east wall of the Coulee we had a very grand and comprehensive view of the northern part of the Coulee, and looked down over 1,000 feet to the waters of the Columbia River. To the northwest we saw through the blue haze the mouth of the Okanogan valley, bordered by low mountains on the west. To the north of the river rises a granite range of low mountains, and eastward the slightly rolling lava plains stretch to the horizon.

The drainage of the Grand Coulee is for the most part underground. The chain of lakes occupying the western border of the Upper Coulee are of varying degrees of salinity. In most cases there is no visible connection between the lakes, and they have no visible drainage outlet. The lakes of the Lower Coulee are fresh at the north and strongly saline at the south. Some of the northern lakes overflow in the rainy season and drain south into the more saline. Soap Lake is the most saline of the chain, and the waters have been analyzed and found to be rich in sodium salts, chiefly the carbonate and sulphate. Moses Lake, farther south, is compara-



LYING IN ONE OF THE DEEPEST EMBAYMENTS OF THE GRAND COULEE, THIS LAKE FORMS ONE OF THE MOST BEAUTIFUL, VIEWS. THE BASALT ROCK OF THE CLIFFS IS A RUSTY BROUN, OFTEN COVERED WITH PATCHES OF ORANGE OR CREENISH-YELLOW LICHENS.

tively fresh, and drains southward into Crab Creek which, after flowing for a while at the surface, sinks into the soil

and disappears.

In the Grand Coulee near Coulee City are several fruit farms of young trees which are doing nicely. Water for irrigation is obtained either from springs, which are often tapped within a few feet of the surface, or pumped from some of the fresh lakes which are suitably situated. In the oldest orchard the trees are about six years old and are just beginning to bear. This orchard is situated about a mile and a half north of the town and is well worth a visit. Here apple and peach trees alternate in the rows, but the peach trees will eventually be cut down, when the apple trees become large enough. In between the trees the owner raises great quantities of fine watermelons which are shared and greatly appreciated by the inhabitants of the Couiee. He is also

raising corn-fed hogs for market in Spokane and for shipment farther east. All of the farms about the Coulee have small vegetable gardens where sufficient for home consumption is produced. The interest of most of the people living near Coulee City is in wheat, and the future of this section seems to rest upon the successful cultivation of that staple product, which can be grown over most of the plains to the east of the Grand Coulee. The higher parts have a good soil cover of decomposed lava and more or less rain throughout the year, so that this region is now producing a considerable quantity of wheat raised by dry farming methods. A crop of 20-25 bushels per acre is about the average yield, but 40 bushels per acre is occasionally reached. The production of fruit and other special crops upon the small areas that are favorably situated for irrigation will undoubtedly increase, but will always be of minor importance.

SPRING SEEDING OPERATION

CTIVE preparations for further reseeding of the Roubaix burn in South Dakota are being made by Forest Supervisor Kelleter. Approximately 1,000 acres will be reseeded this spring and to properly handle this work a Forest Service camp will be established on the ground. During past seasons the work was handled from Roubaix and the laborers employed were for the most part such as lived at Roubaix, but this season's work will be a considerable distance east of Roubaix and the establishment of a camp therefore becomes necessary.

A total of 6,000 acres have already been reseeded at Roubaix and a good stand of trees are to be found over the entire area. This work was inaugurated in 1905 and has been continued each year since. Except for the dry seasons of 1910 and 1911, the work has each year been successful. Native yellow pine seed is used. Experiments

have shown that the best results are obtained by using this species. An extensive experiment was made with Austrian pine, but the results did not seem

to justify further use.

What is known as the "seed spot" method is used in all this work. consists in the removal, by use of a mattock, of the top grass, or sod, for the space of about 12 inches square to expose the mineral soil, and the dropping of a few seeds into the spot and then gently covering the seed with some of the loose soil. By clearing away the sod the young seedling, on sprouting, has a fair chance of pulling through as there is no competition for light and moisture with the grass, as would be the case Under were the same not removed. normal conditions a seed will germinate or sprout and show signs of life in about three weeks after being placed in the

FORESTRY ON THE COUNTRY ESTATE

By WARREN H. MILLER

V. THE PRIVATE NURSERY FOR RAISING STANDARD TREE SEEDLINGS AND HOW TO PREPARE AND MANAGE IT.

HILE State transplants may be had at \$4 a thousand or thereabouts, and nearly every species of tree used in forestry can be bought in either seedling or transplant from any of the big forestry companies which make a specialty of planting wholesale, it is nevertheless a fact that many tree lovers would like to own and run a small nursery in which they not only can raise all the standard seedlings they need for forest improvement but also can experiment with species that have not so far received any attention except in ornamental tree nurseries, and which therefore would prove an exceedingly expensive purchase on a large scale. My good friend and tutor, Prof. Hickel, of Versailles, has for his special hobby an experimental nursery which occupies the whole of what would be otherwise a French gentleman's garden, and, if you wish to win your way right to his heart, send him some fertile seeds of any species of tree in any part of the world outside of the tropic zone, and they will be received with purrs of thanksgiving, duly analyzed, weighed, measured and sketched; after which all that are left will be planted and the forthcoming ' seedlings looked for with the intense interest of the true scientist and raised with all the loving care of the tree enthusiast. His book "Seeds and Seedlings" is the standard French work on the subject.

The writer has been fortunate in having seen in practical operation the largest and most advanced nurseries in France, Germany and our own country. I have watched the force under friend Pettis, State Forester of New York, planting beds of seedlings, digging up those that were ready for transplanting.

setting them out in the transplant beds with Prof. Toumey's wonderful semiautomatic transplanting jig which sets out thousands of them in an hour; have watched the handling of the lattice-andwire cages which Pettis devised to protect the seedlings beds against sun and birds, and compared it with the primitive moss and brush nursery protection of Europe, with their mat screens and rustic frames; have seen plantings of all ages, spacings and forms, from the common hole method to the mound system of Baron Manteuffel; and I have planted and raised some thirty-seven varieties of forest trees myself.

For the owner of a country estate who wants to do his own planting I would say, go ahead slowly at first and accumulate some experience in a small way, more with the idea of making an interesting experiment than anything If you need quantities of small transplants at once, you had far better buy them from a State nursery or a forestry company than wait four years to learn whether you have succeeded or failed with your nursery operations. But, while there are a lot of little practical kinks which have to be learned to make a success of your plantings, there is no reason why one should not start right in on a small scale and learn the art, for there is nothing in it that any sensible man can not easily manage.

To begin with location, there are two sites available, of which you can take your choice, depending upon labor and local conditions. The first is the pepiniere volante or temporary forest nursery located out in the forest itself, a clearing in the forest soil with a northeasterly exposure, and the second is in the home vegetable garden, with artificial means for shading, etc. The



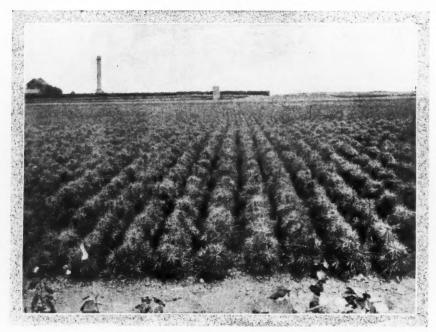
A FRENCH PEPINIERE VOLANTE OR TEMPORARY FOREST NURSERY.

first is less expensive and does not require as much personal care, but the growth is slower and damage from surrounding forest conditions quite extensive; the second produces large quantities of seedlings and transplants in a small space, but requires a lot of looking after, and some expenditure for apparatus.

The principal expense of the forest nursery is that of digging a two-foot trench with perpendicular walls clear around it, to keep out rodents, cutworms and underground fungi; the principal expense of the home nursery is building the wire and lath cages which are put over the beds to keep out birds and produce artificial shade. Here is Baron Manteuffel's own description of the formation of his forest nurseries at Colditz, Saxony, which produced and planted some 21/2 million trees: "It is a good idea to divide the pepiniere (nursery) into numerous small parcels scattered throughout the forest. In the general run of the soil we select the best obtainable, that is to say fresh, loamy,

permeable, presenting a thick couch of dead mould over a reasonably fertile mineral soil. It is not easy to fulfil these conditions, but we earnestly beg our brother foresters to give this selection all the care possible; otherwise they will never succeed in producing strong, healthy plants with the desired spread of roots. We have already said that we have no admiration for plants raised, so to speak, under hothouse conditions. In Saxony most of our plantations are in a mountainous country under a sky inclement and stormy, and for this reason we locate our pepinieres in similar weather conditions. The forester should select his location only reasonably protected from weather damage, even though he may have to wait three years for the plants to acquire dimensions reached in two years in milder climates.

"As regards the preparation of the soil in the pepiniere: The growth of weeds ceases habitually in the month of October, and it is then that we chose by preference to clear the spaces destined for our pepinieres. We scythe



A BIG GERMAN TRANSPLANT NURSERY.

down over the space the weeds and brush and give it a light cultivation about the depth of a spade. Having carefully picked out stones and roots and knocked the rich earth from roots of weeds and grass, we then level off the spot as much as possible and collect in piles all the brush, weeds and roots, and burn them, here and there, over the plot. The ashes of these are scattered broadcast and raked into the soil. Finally we surround the plot with a trench two feet deep to keep out small rodents, mice, etc. At the return of spring, when the last frosts are no longer to be feared, we give the plot a light culture with the rake and then proceed with the layout of the beds and walks.

"We lay out the plant beds in long, narrow five-foot ribbons, running east and west across the pepiniere. The seedings grooves are next creased in the soft earth by means of Bavarian planks, which are laid across the bed alternately, and one has only to walk on them to obtain two double grooves ?

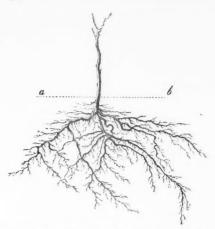
centimeters ($2\frac{1}{2}$ in.) wide spaced 19 centimeters (about 8 in.). For large pepinieres we use a harrow of which the teeth are the proper width to cut suitable seeding grooves and run it lengthwise of the beds.

"As to quantity of seeds required, we find that for spruce half a pound of good seed suffices for 19 square meters of pepiniere. For sylvester pine we use practically the same amount of seed as we find that to avoid the roussi, a fungus disease that attacks the young pines in their second year, it is necessary to mix the spruce and sylvester pines in the proportion seven-eighths spruce to one-eighth pine. We do not advise the culture of fir in temporary pepinieres at all, as to give the young plants the thick mat of roots they should have it is necessary to clip the pivot root and transplant, and this should only be done in large permanent pepinieres."

This, in brief, gives an outline of a tried method of raising seedlings that will make good forest growth without the usual transplanting. The seeds are

sown in rows instead of broadcast as in the garden nursery beds, and are so spaced as to allow the seedlings room enough to become vigorous plants on their original planting site. Moss is kept over the seed rows until the sprouts appear and then placed between the rows to keep down weeds. Owing to the northeast exposure, the growing conditions imitate Nature very closely, having only the morning sun direct, and the rest of the sunlight is filtered through the trees along the south wall of the nursery after noon. In this way the young plants make a hardy, if slow, growth, without the necessity for han-

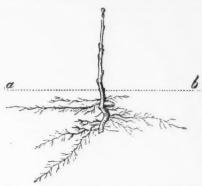
is of such importance that the writer would be in favor of root pruning in the soil sooner than omit it entirely. Left to themselves all forest tree seedlings follow their natural instincts and send down a deep tap root, not for food but for protection against being pulled up by the roots by the first rabbit that nibbles their tops. A young fir will send down a root twelve times as long as its trunk above ground, and all the other species from four to six times as These roots get a firm hold on long. the mineral soil but contribute little to the nutriment of the young tree, for all the feeder roots must seek their food in



Young Oak Transplant in its First Year. Note Root Spread Due to Cutting Tap Root.

dling shade crates daily, and, as they grow in the same soil they are transplanted to in the main forest, they have no unaccustomed soil conditions to readjust themselves to later. It is a wellknown fact that domestic vegetables and trees will not succeed at all in forest soil, because it is too sour and too lacking in the bacterial growth that these plants require to thrive, and the reverse is undoubtedly true as far as my own observation goes. Nursery forest trees raised in rich vegetable soil have been so modified in their root habits that they have a lot of adjusting to do and lose several years doing it before they take hold of raw forest soil.

The matter of cutting the pivot root

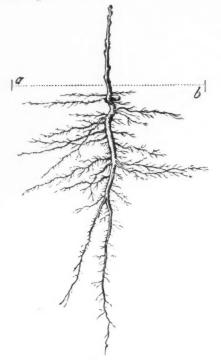


Young Oak Seedling With Tap Root Cut, Ready for Transplanting.

vaporous form in the humus under the mat of dead leaves, where the warmth of the sun and air above can produce vapors suitable to enter the little root buds. Now we know well that our seedlings will never need their tap roots for protection, so, upon transplanting, we snip this root, thus forcing the plant to put out its feeder roots forthwith. The result upon the growth of the plant is inconceivable to one who has not actually seen it done. Our illustrations show the contrast between young oak, ash, fir, pine and spruce seedlings with and without their tap roots cut. Note the far greater growth and vigor of those with the tap root removed. In commercial nurseries this is done without digging up the tree by what is known as root pruning, i. e., the spade is driven into the ground all about the

plant, cutting its long, rambling roots and forcing it to put out a set of thick feeders close around the stem. When transplanted it then has a large proportion of its roots already grown and in the ball of earth, and, when once in its final site, these form the nucleus of feeders which stretch far and wide through the humus.

State Forest Service, has gone about as far as any man in the public service towards the development of the systematic raising of millions of young trees, and Prof. J. W. Toumey has made the greatest advances in developing the commercial raising of young trees for forestry purposes. The methods of both are similar: the unit bed is 4'x12', rais-



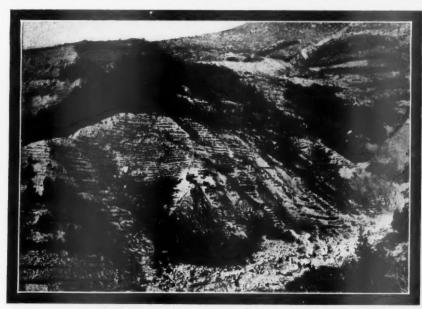
YOUNG OAK SEEDLING JUST OUT OF SEED BED



Young Fir Seedling Tap Root Twelve Times as Long as Stalk Above Ground

American practice has tended towards raising large quantities of seedlings in as compact beds and as rich soil as possible, transplanting them to beds on larger spacing, and then settling them out in the field as four-year transplants, that is, plants which have had two years' growth as seedlings and two years as transplants. Such specimens are husky little trees, standing about a foot high above the root collet, and taking a hole a foot in diameter by nine inches deep to accommodate the root spread. C. R. Pettis, of the New York

ing about 7,500 seedlings, a rich, well-fertilized soil is selected and cultivated, the seeds are sown broadcast and very thickly, tamped in with a flat rammer, and over them is sprinkled a quarter inch of sand. The wooden crate, which is used so much throughout the younger days of the seedling, now comes into use and is put over the freshly seeded bed and closed in with loose laths between the shade laths with paper tacked around the sides. After a period of some three weeks' germination the paper and loose laths are removed, as



REFORESTING A DENUDED HILLSIDE, MERDARE, FRENCH ALPS.

all the seedlings have sprouted and require air and sunlight. On mild days the lath crate is also removed, leaving nothing but the wire cage over the bed, which keeps out birds and prevents them from picking off the tender young shoots of conifers, of which they are very fond. If the sun gets hot enough to wilt the young plants the lath crate goes on again, producing the artificial shade that is gotten by a north exposure in the forest nursery. The principal enemy to be feared is, however, "damping off," a fungus disease which attacks the young conifers when conditions of cold and dampness are maintained in the seed bed for any length of time. During the second year the seed bed requires not much attention beyond weeding, although, during the first year, the lath cage has to be on most of the time. At the third spring the seedlings are dug up, put in a trans-planting jig, a sort of spring clip four feet long with grooves spaced four to six inches for the seedling stems. The pivot roots are clipped with a single sweep of the knife and the young seedlings set out in the transplant beds to

remain there two years more. The cost is about \$3.90 a thousand to produce four-year transplants of pine or spruce by this method, and it is a practical way of handling large quantities—millions—of forest trees, with very few losses and not much area per tree of nursery space. It is particularly adapted to conifers, but by no means so handy for the broadleaved species because of the much greater room that the latter require.

We have now an outline of the two principal nursery methods in use today in Europe and at home; how do they apply to the owner of the country estate? In the first place, he will not be particularly interested in raising great quantities of any one species but will rather want a nursery that will have versatility enough to prepare quite a number of different species of tree seedlings in batches of a thousand or so, with the idea of avoiding the expense of paying the commercial nursery prices for young trees, which run into a great deal of money that might just as well be saved. Our nursery should have a few crates of the 4'x6' size, that can be handled by one man, for raising coni-



A SEED BED NURSERY AT LAKE CLEAR JUNCTION, NEW YORK, CONTAINING THREE MILLION SEEDLINGS IN TWO ACRES

fers to reforest abandoned and stony pastures; and the beds for this crate work, with its intensive planting, should be enriched with well rotted leaf mold compost, but not with commercial fertilizers, as many of these are extremely unsuited to wild forest seedlings. The balance of the nursery space should be devoted to the broadleaved species, oaks, maples, ashes, tulips, hickories and any other specialties that you intend to raise. This soil should be cleared forest loam with northeast exposure, a cleared forest meadow in the woodlot, and the seeding done much as in European practice with the seeds in rows, spaced some three inches in the row and transplanted and clipped in their second They are ready to set out in the forest in the third year, that is the fourth spring, and should be set on about nine-inch spacing with this end in view. The ground in between is covered with a couch of dead leaves with the object of keeping in the moisture of the soil, keeping down the germination of weeds and adding to the nutriment of the young plants by the gradual decomposition of the dead leaves-in effect Nature's own way of caring for her little ones in the forest. A reasonable amount of dead twigs and limbs should be scattered over this

couch of dead leaves in between the rows, for the amount of leaves that the wind can steal in a single season is almost incredible to one who has believed that his work ended with carting the leaves and spreading them over the bed.

As to the depth to plant seeds and the time, an inch deep is plenty for acorns and nuts, much deeper for black walnut, half an inch for maple and ash. Almost all of the them are planted as early as possible in the fall and usually sprout and get to about four inches high before going into that winter. Red maple seeds in the spring, in May, and its young ones have all summer to grow in. The conifers all sprout in the spring, and are best seeded in April and May after the frosts are well out. If put in earlier they are quite apt to rot, for Nature's way of planting them consists in giving the seed blown from the cone in the fall a whole winter to work its way down to the quickening combination of humus and mineral soil, and if put in this soil without the heat to start germ growth the seed quickly rots. Ash seeds should be gathered in the fall as soon as ripe and piled with sand and leaf compost in beds not over ten inches deep. They are to be turned over several times during the winter



STATE FORESTERS VISITING THE NEW YORK STATE NURSERY AT LAKE CLEAR. STATE FORESTER PETTIS OF NEW YORK ON THE EXTREME LEFT.

and sown in the nursery beds broadcast on about inch spacing where they will do for the first season. The winter rotting clears them of the samara wings and prepares the seed for germination. They are ready for transplanting in the second spring, and for the forest in the third spring. Sugar and silver maple samaras ripen in October and fall to the ground. The seeds can be kept through the winter in moderately damp sand, or else sown at once in their beds, in which case a larger percentage of them will fail to germinate. In either case, they will come up the first spring, are transplanted the second spring and are ready for the forest in the third. For lirioden-dron, the seeds should be sown the autumn they ripen, being picked from the sheath and sown in beds of fine, rich sandy loam in a moist, shady location. They will come up the following spring, or, if sown in the spring, will come up the following year. With the acorns of the dozen species of oaks which you will have to deal with in your forest, an

immediate fall planting is the best course. They are apt to either germinate or dry out if kept through the winter in sand, and once germinated your troubles come on apace. In my own neighborhood the white oaks succeed in starting a number of seedlings in the same fall the acorns come down, while the red, blackjack, and chestnut oaks usually hold over until spring and we get a fine germination where there is the least sun on the forest floor. The first acorns down are always wormy, so be chary about gathering them, but the second big storm will fill the forest with large, heavy, meaty acorns which will sprout in a few weeks if planted at once, and by mid-October the seedling is three inches high and has two to four small leaves on it. In colder localities the acorns will not sprout at all until the following spring.

In one part of your nursery there should be space reserved for saplings. While four-year conifers are about right for forest underplanting, a good many of the broadleaved species will

reach a tree six feet high in five years and are in better shape to set out than if put in the forest on their third spring. If at that time, instead of taking to the forest you make a second transplanting to the sapling bed, you will add to the vigor of the succeeding root growth and push the young tree along faster than if you had set it out. Specimens for particular localities where they are wanted for their scenic value as soon as possible had best be forced here in the sapling bed, being set out on eighteen-inch centers with the usual dead leaf couch in between rows. At their fifth spring they are ready for use and far ahead of the three-year tree already out in the forest two years. As a lot of the root system will necessarily be lost in digging them up, they should be pruned somewhat in the crown so that the tree can occupy itself exclusively with root growth during its first year in the forest. And this must not be done severely as with fruit trees; neither oak, ash, maple or beech can be pruned to a whip, as is done with a young peach, and to cut it off short as is done with a one-year apple would be simply killing the tree with excess of sap, for the bark of an oak is so tough that it by no means can push forth new branch buds with the ease of the fruit trees, while a beech must have shade on its trunk when young or the bark will be scalded. The only pruning required while in the sapling nursery will be a clipping of the outer twigs to a pyramidal head and the removal of the second branch in case the tree seems inclined to fork. planting of broadleaved species provide for a good many more than you propose to set out, so that you will have a chance to reject all crooked seedlings and return all the spindly ones to the nursery. Having decided upon an area that will raise all the conifers, broadleaves and saplings you require on the above spacings, see that it has access to running water for irrigation or sprinkling in time of drought, make its boundaries rectangular for economy in bed space, trench around it to keep out rodents and put a two-foot chicken wire fence along the inside edge of the trench to keep out rabbits which would otherwise

kill off all your young broadleaves by nibbling the tender young buds. You will then have a practical working nursery that well repays its cost in saving seedling and sapling expense.

The subject of underplanting the forest, of planting abandoned pastures in conifers and of planting both conifers and broadleaves at advantageous points in the forest has been pretty well gone into in previous articles in this series. I show an example herewith of reclamation work in Merdare, French Alps. which applies to reforestation work on our own hillsides where the slope is very steep. In the case shown the slopes had been entirely denuded and not even heather could get a foothold; the brook in the ravine had gone dry. and scouring of the mineral sub-base had begun. The first thing to do was to arrest this scouring, and this was done by digging shallow trenches, parallel, six feet apart, with the mound of earth excavated always piled in a low rampart on the downhill face of the ledge. This formed a pocket, in which the rows of young transplants were planted forthwith. The scouring action of the rains immediately began to fill in the hollows behind the ramparts and reduce the slope to a sharp angle again, but long before this could be accomplished the young trees had taken firm root in the soil of the ramparts and ledges and had made considerable growth. They at once stopped the scouring and soon formed a forest mold of their leaf-fall, and in a few years that hillside was covered with a dense forest and the springs began to flow once more. France spent over 260 million dollars in reclaiming such denuded slopes in the French Alps and the Pyrenees, and brought over 10,000 torrential streams under control in this way. The forests were cut down and sold by the extravagant and ignorant Directory of 1790; for fifty years the country endured the droughts and floods occasioned by this denudation of the mountain slopes, and finally decided to restore the forests at any cost. The resulting increase in land values alone has more than paid the Republic for its expenditures.

MANY USES OF THE FORESTS

LMOST every conceivable use to which land may be put is represented in the permits reported by the Forest Service for special projects on the national forests. Some of the uses shown range, alphabetically, from apiary through brickyard, cannery, cemetery, church, cranberry marsh, fox ranch, marine railway, rifle range, and turpentine still, to wharf and whaling station.

There are 15,000 permits in force for such special uses, which are distributed geographically from Alaska to the Mexican line, and east to Florida. This figure does not include any of the 27,000 permits in force for grazing cattle and sheep on the forests; nor the 6,000 transactions for the sale of timber, and the more than 38,000 permits issued last year for the free use of timber by settlers, miners, and others in developing their homesteads and claims; nor the nearly 300 permits for water-power development.

California led all the national forest states in the number of these special use permits, followed by Arizona, Colorada, Montana, and New Mexico in the order named. The largest single class of permits was for special pastures, or corrals, to be used for lambing grounds, shearing pens, and the like. Next came

rights of way for conduits, ditches, and flumes, practically all of these being free. Various agricultural permits come third, telephone lines fourth, with more than a thousand permits for 6,500 miles of line, and drift fences for the control of grazing animals, fifth. In both of these latter classes, too, practically all of the permits are free. Reservoirs for which more than 600 free permits were issued for the occupation of more than 100,000 acres, come sixth. The rest of the uses are not classified, though there are a large number of apiaries, camps, summer hotels, and schools. The use of the government's lands for schools is given free; for hotels a charge is made.

The principle which governs the charge is based, according to the Forest Service, on whether or not the use of land is sought by the permittee for a commercial purpose. If it is the intent of the user to make money from a resource which belongs to the whole people, the Service holds that he should give a reasonable return for that use. If, on the other hand, farmers want to use government land for their own telephone lines, irrigation works, and schools, the government gives them that use without cost.

Railroads and Forest Fires

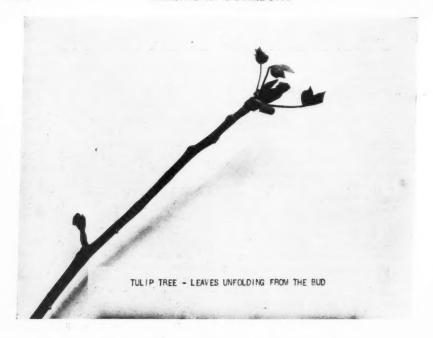
New Jersey is said to have the greatest proportion of railroad mileage of any State in the country, or one mile of railroad to every three square miles of territory. This makes an unusual risk of forest fires set by railroads.

Building Forest Trails

The heavy storms in southern California during the past rainy season wiped out many miles of trails in the national forests of that part of the State. They are now being rebuilt for the coming summer, for use in fire protection. They are also of great use to tourists, campers, and prospectors.

Perhaps a Bad Fire Season

In many parts of the West snow is leaving the mountains earlier than usual. Foresters say that this may mean a bad fire season, and they are making plans for a hard campaign.



YELLOW POPLAR PROFITABLE

ELLOW poplar, one of the finest and the largest of American broadleaf trees, can be grown profitably in the timber tracts of the southern Appalachians. This conclusion is set forth in a report written by W. W. Ashe, of the Forest Service, and recently published by the Geological Survey of Tennessee.

An investment in young yellow poplar stands will yield 4 per cent compound interest. In addition to this, there is a probable, though indeterminate, return due to the natural increase in stumpage prices. This increase, based on average-sized yellow poplar trees, has amounted during the past 20 years to 13 per cent compounded annually.

There is more lumber produced from yellow poplar than from any other southern hardwood except oak. The commercial range of the tree is restricted mainly to the southern Appalachian Mountains of the Virginias, Carolinas, Kentucky, and Tennessee,

where it grows to be more than 100 feet high and over 5 feet in diameter. Some specimens have been found in Virginia nearly 200 feet high and 10 feet through.

The wood itself has the same general characteristics as that of white pine, and its range of uses is about the same. Each is utilized for almost anything not requiring great strength or toughness.

The qualities which favor the extensive use of poplar are its straight grain, its lack of odor, the readiness with which it takes paint, and the ease with which it can be worked. Doors, paneling, packing boxes, type cases, drawers, kitchen woodenware, and toys are made largely of yellow poplar. In Tennessee wooden mixing bowls are turned out in sizes up to 4 feet in diameter from one piece of wood. Yellow poplar stands well in situations exposed to the weather, as in pumps, outside steps, shingles, and fencing. It is not durable in contact with the soil, though it can be readily treated with preservatives.

From the earliest times poplar has been used in making dug-out canoes, for which it is specially suited since it is easily worked and is light. In this capacity the tree did yeoman service in the early Indian wars of the South. In 1779, an attack upon the Carolina

food stuffs, and for refrigerators. Its straight grain adapts it to the making of matches, and the ease with which it takes glue makes it useful as a core wood upon which more expensive veneers can be placed. It makes a very good paper pulp.



THE TREE IN WINTER.

A TULIP TREE IN ROCK CREEK PARK, WASHINGTON,
D. C., SHOWING FLOWER CUPS.

frontier was threatened by Indians who assembled near Chattanooga. Isaac Shelby, one of the pioneer leaders, had 5-foot trunks of yellow poplar hewed into canoes, in which he took his 750 men down the Holston River to attack the tribes.

The wood lacks odor, and this quality permits of its extensive use for containers for butter, cheese, and other



A TULIP TREE.

THIS TREE IS IN PIKE COUNTY, OHIO. NOTE THE MANNER IN WHICH THE BRANCHES SPREAD.

The tree grows best on a good, moist soil; when grown on dry soil the wood is likely to be harder and to consist largely of light-colored sapwood. It will not pay, however, to grow it on rich agricultural bottom lands, which will bring higher returns from the cultivation of farm crops. For timber production, therefore, it should be grown upon the slopes and coves between the bottom lands and the dry heights.

The days of the old trees are numbered, and, for this reason, it is desirable to pay more attention to the second growth. The second growth, though not to be compared with the old giant trees, which are practically all heart-



A Magnificent Tree.

This tulip poplar is in central maryland and is a splendid specimen. Note the extent of its branches and its great value in its particular location as a shade tree.



YELLOW POPLAR.

THIS IS WHAT THE TREE IS CALLED IN MANY SECTIONS. THE PHOTOGRAPH WAS TAKEN IN LEE COUNTY, VIRGINIA.

wood, still makes valuable lumber. So far as known, the tree is not subject to severe injury either from disease or insects. Its chief enemy is the one



BIG TULIP POPLAR.

NOTE THE STRAIGHTNESS OF THE TRUNK AND COM-PARE SIZE WITH FIGURE OF MAN AT THE BASE OF ADJOINING TREE.

common to all forest growth in the Southeastern States-fire.

One important point particularly accented in the report is that poplar stands should be properly thinned. Such thinnings should yield a money return and at the same time increase the value of the stand when it matures. In thinning the aim should be to give the tree

plenty of room for light and growth, and this will mean fewer trees, each one with a large value, rather than many small trees of less value. This is shown strikingly in the report, which says that it will be far more profitable to have 70 trees on an acre with average diameters

of 20 inches than 160 trees with diameters of 15 inches. The 20-inch trees have a stumpage value of \$3.61 each, while the 15-inch trees have a stumpage value of only 83 cents apiece. The acre of larger trees, therefore, will be worth about \$120 more than the other.

BETTER FOREST FIRE LAW

By WILLIAM R. FISHER

WO supplementary acts were passed by the last General Assembly of Pennsylvania, which are expected to add materially to the efficiency of the forest fire protective

service of the State.

Act No. 432 provides for a system of fire patrols under the joint co-operation of the Department of Forestry and private fire protective associations. The cost of maintenance is to be equally divided between the two parties to the agreement, and the private organizations which avail themselves of the benefits of the law are required to make an annual report upon their activities to the Department. This official recognition of the private fire protective associations under the law will give them higher standing in the estimation of the public and increase their importance and their influence.

Another Act (No. 414) tends in the same direction, and its effects will surely bring into closer relation the private associations and the State Department of Forestry. The act authorizes the Commissioner of Forestry to assign foresters to duty as district foresters in such counties as, in his judgment, "the demands of forestry warrant." It then becomes the business of the district forester to bring the uses and purposes of practical forestry to the attention of the people, to collect data and to assist owners of forests and woodlots; to conduct experiments, to assist in Arbor Day work, to inspect and report to the Forestry Department upon the work of the fire wardens, and "to promote and advance any other activity in local forestry that may be designated by the Department of Forestry." This comprehensive phrase will enable the Department to give a wide range to the functions of the district forester.

Under the act the Pocono Protective Fire Association asked for the appointment of a district forester for Monroe County, and the Commissioner promptly responded to the request. The need of local State officials to look after the work of fire wardens has been plainly urgent for a long time, but hitherto there has been no provision under the law for supplying the want. This act furnishes an effective agency for the desired object.

Before these important additions to the machinery of forest fire protection were brought about, the people of the State were, in some respects, not so well protected against forest fires, under the existing law of 1909, as they had been under the old law. In former times each county bore the expense of whatever forest fires broke out within its borders. The township constables were the fire wardens and the County Commissioners paid the bills. So in this way, the burden of the cost for fire-fighting fell upon the county which was immediately concerned in the fire losses.

Under the present law, however, the State Commissioner of Forestry is the Chief Fire Warden and has charge of the suppression of forest fires all over the State. Every two years the General Assembly makes an appropriation to cover the estimated expenses of taking

care of forest fires until it meets again, guessing at the amount that will be needed. Here is one of the weak points in the system. No one can tell beforehand about the extent of forest fires. Sometimes the guess is too high, and sometimes it is too low; and when the appropriation is exhausted before the time arrives for which it was set apart, the whole State must needs go without fire protection until the Assembly meets again, and a new appropriation is made. And, again, if one part of the State suffers extensively from fires, the money appropriated for the benefit of the whole body politic may have to be spent in that particular section, to the detri-ment of the remainder. While there is no remedy at present for this awkward and dangerous situation, a condition which has actually existed and on one occasion has placed the Commonwealth of Pennsylvania without forest fire protection for a period of eleven months, yet we may take much comfort and satisfaction from these two supplementary acts which were passed by the last Legislature, and look forward with confidence to further improvement in the laws, later on. It is a gain for the private associations to have recognition

by the State and to be able to co-operate with State authorities in patrolling places of danger, but the great step in advance is the privilege which each county now has to provide itself with a competent State official to take charge of the fire wardens and to regulate their actions. Fire fighting, like everything else that is worth while, requires knowledge and experience. A trained man will do much more than ten greenhorns: a section gang from a railroad, who are used to working together and have been taught to obey the orders of the foreman, will put out a fire much quicker than fifty farmers who turn out in response to an emergency call. Where there is no discipline a great many stand around and do little or nothing except to turn in their time of loafing and draw their pay.

We really need trained fire fighters as well as trained fire wardens to direct them, but it is too much to expect such perfection at the present time. We are content with the good prospect of having competent men of intelligence and experience to act as wardens throughout the heavily wooded por-

tions of the State.

WARNINGS AGAINST FIRES

OST cards cautioning forest users in the Appalachian region against setting fires in the woods have recently been sent by the Federal Forest Service to residents in the vicinity of the forest areas which have been pur-

chased by the government.

These post cards state that burning of the woods does not improve the grazing, and does not exterminate poisonous insects or animals. On the other hand, the cards say such burning injures the grazing value of the land by killing off the better grasses, by decreasing the fertility of the soil and by increasing the possible damage to the ground, and its covering of vegetation, from frost, sun, wind and rain. Furthermore, they state that burning injures the timber, impairs its merchantability, and lowers its selling price; that it increases insect damage

by weakening the vitality of the trees and affording an entrance for insects through the fire scars, and, in addition, that it kills out the young trees which

are just getting started.

For the reasons enumerated, it is announced that no grazing will be allowed on the government lands which have been recently burnt; the rule being enforced in order to give the range a chance to recuperate from the effects of the burning. The effect of this prohibition will be to close certain areas against grazing; therefore fires set through a mistaken notion that they will improve grazing, will curtail the forage resources.

The cards further ask cooperation of all forest users in the prevention and

control of forest fires.

HOW WOULD YOU DO IT?

UPPOSING you were seventyfive miles from the base of supplies and having but four pieces of rope, the longest 100 feet, two double and one single 6-inch sheave blocks, axes, two-man saws, hatchets, crowbars, lineman's climbers and a brace

crowbars, lineman's climbers and a brace and bit, it became necessary to imediately erect a fire lookout tower 100 feet high, what would you do?

That is the problem which confronted some Forest Service men in the Sitgreaves National Forest of Arizona a short time ago. This forest, covered with tall timber, has no good natural lookout points. It therefore is necessary to build towers tall enough to overtop the high trees.

Mr. Bristow Adams, of the Forest Service, tells of how the problem outlined in the first paragraph was solved.

He says:

"A triangulation station was needed on the Chevalon District, and having in mind several points upon which the timber was only 35 to 40 ft. in height, it was planned to build where a 40 to 50 ft. tower would be sufficient. Accordingly, such to ols and rigging as were at hand were thought to be adequate, and they

would have been for the construction of a tower of the size we expected to

build.

"It was found, however, that there was only one point from which a satisfactory view over the forest in all directions could be obtained. Unfortunately, the timber was so tall there that it was

evident that a tower must be over 100 ft. in height to be of any use.

"The dangerous fire season was near at hand, and we were 75 miles from any base of supplies, so it was decided to build the tower with what tools and rig-



Pigure 1. Promontory, Butte Lookout Tower, Sitgreaves National Forest, Arizona.

ging we had. We had only 300 ft. of 34-in. rope in four pieces, the longest being 100 ft. in length; two double blocks 6 in. long and one single-sheave block of the same size.

"Our tools consisted of axes, twoman saws, hatchets, crowbars, two pairs of lineman's climbers and belts, and a brace and bit. Telephone wire was used for guys.

"The crew was made up of temporary employees and two rangers, under the direction of one of the forest rangers. At the start there were eight men, including one cook, one teamster, and the man in charge. By the time the tower was half built the crew was cut down to four men.

"The first task was to cut and peel the timbers and skid them to the spot where the tower was to be erected. Much care was necessary in selecting the main poles, some of which were skidded out of dense thickets. Altogether, over 2,600 lin. ft. of poles was used. The dimensions of the tower are as follows: base, 30 ft. square; platform top, 6 ft. square; height, 115 ft.

"The main corner poles averaged 16 in, in diameter at the butts and 4 in. at the tops. They are spliced at heights of 45 ft. and 100 ft. Each splice is bolted and then bound with bands of telephone wire (see Fig. 3). The timbers are fastened together with ½-in. lagscrews. The floor is constructed of 2x6-in, lumber and the rail is of 2x4-in. and 1x4-in. lumber. With these exceptions, no sawed lumber was used in the tower.

"In raising the poles a tree nearly 100 ft. in

height was used as a derrick mast; but since the top of this tree was not stout enough above a height of 75 to 80 ft. to carry much weight, some difficulty was experienced in placing the 55-ft. poles upon the tops of the 45-ft. ones below.

"With an abundance of rigging, a

derrick boom could have been rigged, which would have simplified the work to a great extent; but it must be remembered that we had only three pulley blocks, and they had to be used in hoisting each pole or brace. We were so short of rope that when we raised the second length of the main poles, it was necessary to hoist until the blocks came together, lash the pole so that it



FIGURE 2. LOOKOUT TOWER SHOWING METHOD OF FRAMING.

could not fall, and then stretch the tackle for another pull.

"The men of the crew had no previous experience in building towers and wereby no means expert climbers at first, but they improved rapidly, so that before the tower was completed, several of them were excellent men for high work. "The first poles were cut on May 21, and the tower was completed and in use on June 20. The time spent in cutting and peeling logs and constructing the tower amounted to less than 24 working days of 8 hours each, for a crew which averaged five in number. In addition, a t w o - h o r s e team was used 9 days.

"Four galvanized-wire cables 1/2 in. in diameter will be added as guys. A copper cable reaching up and over the center of the tower will follow one leg to the ground and serve as a lightning arrester."

Apache Forest News

During 1913, 28,570 head of cattle and horses were grazed on the Apache Forest under permit. The average number for each stockman was only 138 head. The Forest has a greater number of trout streams than any other National Forest in either Arizona or New Mexico.

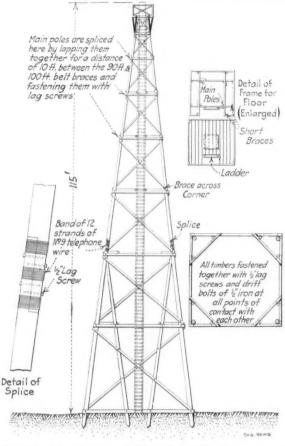


Figure 3. Structural Details of the Promontory Butte Lookout Tower and Triangulation Station.

Pictures in this article by courtesy of the Engineering News, New York City.

Reforestation for \$7.50 An Acre

Nearly 4,000 acres were reforested in Montana and northern Idaho during 1913, at an average cost of \$7.50 an acre.

China's Best Forest

The best forested area of China is in Manchuria. The principal tree varieties are pine, cedar, larch, fir, yew, oak, ash, elm, walnut, and birch.

Valuable Instruction

Two forest officers, in Washington and Oregon, are writing popular descriptions of the trees on the Crater and Mt. Rainier national parks, for the use of visitors to the parks.

Wyoming's Highest Mountain

Gannett Peak, Wyoming, nearly 14,000 feet in elevation, and the highest mountain in the State, is on the divide between the Bonneville and Bridger national forests.

THE FOREST PRODUCTS EXPOSITION

PENING on April 30 at the Coliseum, Chicago, the Forest Products Exposition is now well on its way to the success which the careful plans of the promoters and the enthusiasm of the exhibitors assured. There was to be seen not only every wood in commercial use in the United States but exhibits of every branch of the forest products industry, and in addition, and of particular importance, were the exhibits of the United States Forest Service, the American Forestry Association, the American Wood Preservers' Association and the Western Forestry and Conservation Association, showing as they did the value of the best utilization of the forests, of the preservation of wood and of the conservation of forest lands and the protection of timber. The thousands of daily visitors not only had entertainment, for the exhibits were a delight to the eye, but they had brought home to them what perhaps many did not realize before, the great economic importance of the forests, the need of their care and development and the very many uses to which wood may be put.

The educational and the industrial value of the Exposition, it soon became apparent, was even greater than had been anticipated. Teachers and school children from all the schools of Chicago flocked to the display; the general public found unusual interest in the various features, while the contractors, architects, builders, and the men of numerous vocations directly or indirectly concerned in wood and its uses found much of practical benefit to them. It is early to speak of the business-getting value of the Exposition, but as advertising gets business, and as there could be no better advertising than the exhibits with their many very attractive features, it is apparent that the exhibitors will be amply repaid for their expenditure in cash and in effort.

The Exposition will open at the Grand Central Palace, New York, on May 20 and continue there for ten days.



Crow: SAY, DON'T YOU KNOW IF YOU CUT DOWN ALL THE TREES BY AND BY YOU WILL HAVE NO WATER FOR YOUR HOMES?

Published by courtesy of Life. T

26,000,000 Trees Planted

Norway has 144 tree-planting societies. The first was founded in 1900, and since then 26 million trees have been planted, more than 2 million having been set out last year.

GAME AND FISH INCREASE

By PROF. D. LANGE. Superintendent of Schools, St. Paul, Minn.

HERE is no region in the world where the hunter or camper, or the general lover of outdoor life may find such absolute freedom as in our own North Woods, and if the resources of this great country, which equals about the whole of Great Britain, were better known, the people of St. Louis, Kansas City and Omaha, in fact all the inhabitants of the Mississippi Valley, would resort to our own North Woods, just as the people of Europe flock in hundreds and thousands to the Alps.

I should like to call attention to the possibility, and, as I believe, to the ne-cessity of encouraging the domestication or semi-domestication of game and

fur-bearing animals.

Although it is an axiom of game protection that wild game cannot be sold on the market, it seems ridiculous that in this young country, where we still have such abundance of game, and such enormous areas of wild land, it is practically impossible to buy game, while in such old countries as Germany and England venison can frequently be bought at least as cheap, if not cheaper than, beef. The answer is that in Germany and England a great deal of game is kept in a state of semi-domestication.

It appears that the greatest lure to the North Woods are the fish, which still teem in the countless lakes.

I believe the time has come when a careful study should be made of the fishery resources of Minnesota in International as well as in State waters. I believe that with scientific management the production of one of the most wholesome food supplies could easily be

increased ten or a hundredfold in this State, but the thing that is most needed is a careful, scientific study of the conditions governing the fish life in the several large bodies of interstate and international waters.

For instance, how could the fisheries in Red Lake and Mille Lacs be made most productive? What would be the best methods of utilizing the fish in the Minnesota River and in the interstate waters of Lake Pepin, the Mississippi and St. Croix Rivers, and in the international waters of Lake Superior, Rainy River, Rainy Lake and Lake of the Woods? The sturgeon of Lake of the Woods have become comparatively scarce and small, and as yet no method is known for their successful propaga-

The same statement is true of the spoonbill found in the Mississippi and the Minnesota, and which once was exceedingly common in Lake Pepin, but has now become rare. Of this fish no successful method of propagation is known.

It may be news to some of my hearers that there is one fish inhabiting Minnesota lakes and rivers which goes to the ocean to spawn. That is our common eel. When the eels are sexually mature they migrate out of the rivers to the ocean and spawn there.

I believe that a systematic study of the fishery question would discover some way by which our fish resources can be commercially utilized without infringing in any way upon the rights of sportsman, which, of course, should be

respected.

In Charge of Field Work

Mr. Kenneth M. Clark, of the James W. Sewall office of Old Town, Me., has obtained two months' leave of absence, during which time he will take charge of the field work in timber estimating and surveying for the Harvard Forest School.

THE SOUTH'S FORESTRY AND WATER RESOURCES*

By HENRY S. GRAVES, Chief Forester.

HE South today is standing on the threshold of a vast industrial development. The extent of this development and, consequently, the advancement and prosperity of the South itself, depends very largely on two factors: the production of raw material from the farms, forests, and mines, and the protection and development of water resources. The South is preeminently favored in both these respects. It is not merely the great amount of navigable waters stretching far back into the different States, available for cheap transportation, but vast water powers which are rapidly transforming the South into a manufacturing as well as an agricultural section.

The development of the greatest usefulness of these water powers is most intimately bound up with the preservation and protection of the forests at the headwaters of the streams. Of the total estimated potential water power in the United States (36,900,000 horsepower), 11 per cent is found in the Southern Appalachians. In North Carolina, South Carolina, and Georgia alone there are about 1,321,000 potential horse-power, of which so far only 32 per cent, or 429,000, are actually developed and are being utilized.

In the southern mountains there is one factor that far overshadows all others. The danger from erosion is peculiarly great in the Southern Appalachians, because the region has a very heavy rainfall, and as soon as the soil becomes exposed it erodes quickly and violently. Furthermore, the ground in this region is bare of snow during all of the year except a few weeks in winter, and is therefore subject to the action of water during practically the entire year.

Still another condition which tends to increase erosion in the Southern Appa-

lachians is the extreme frost action. The ground freezes at night to the depth of an inch or so, and a layer of soil from 1 to $1\frac{1}{2}$ inches is lifted from the surface by columns of ice. In the daytime the melting ice lets the surface earth back into place again. This process constantly at work allows the heavy rains to remove readily the loosened soil from the exposed slopes.

Because of the lack in the South of natural storage in lakes and marshes, the washing away of the soil from the mountains removes the only natural storage reservoir for the flood waters and thereby decreases the amount of power that can be developed continuously throughout the year. Some of the Southern rivers, like the Roanoke, which rise in the mountain regions have, as it is, extremes of high and low waters. This condition is due to the lack of natural storage basins, and these rivers would become entirely uncontrollable and practically useless for water-power development were the natural protective cover at the headwaters to be destroyed.

Injudicious timber cutting in the mountains, forest fires which usually preceded, accompanied and followed lumbering, and above all the clearing of high mountain land for agriculture, followed by improper methods of cultivation, all these things together have brought about erosion in the mountains which already has produced evil consequences.

SOIL GOES INTO THE STREAMS

The soil washed from the mountain fields goes into the streams. The destruction of farm land in the valleys is enormous, especially during wet years. In 1901, the estimated damage by floods in the valleys of the rivers flowing from these mountains was \$10,000,000. The finer eroded material is carried down

the stream and deposited where the current becomes checked; and especially in the reservoirs constructed for waterpower use where the water is quiet and therefore the silt most easily deposited. This fine silt is deposited also in the navigable portion of the stream. This necessitates constant dredging to keep the stream open for navigation.

The process of denudation of the mountain slopes already has seriously affected the capacity of the Southern streams for water-power development. One prominent Southern engineer has estimated this to be at least 40 per cert. Apart from the menace to the water powers, the washing away of the soil from the mountains and from the fields in the Piedmont region is a very real danger to the water supply of the cities and towns both from the standpoint of quantity and quality. Fifteen years ago the streams in this region carried far less sand, silt, detritus, and washings than now. These have been filling up the channels and increasing enormously the expense and difficulty of purification so that many cities now face not only a shortage of water during the lengthy drought periods, but unknown dangers in the water which they do get. As an example, the city engineer of Augusta, Georgia, stated in 1908 that their power canal had re-ceived more silt in the last 18 months than in all the 30 years previous. If this is the case with only a portion of the mountain slopes denuded, what will be the plight of Augusta and other cities similarly situated when the bulk of the forests is gone?

In the Carolinas and in Georgia alone over \$50,000,000 is now invested in cotton mills run by water power directly or by electric power generated therefrom, and this is only the bare beginning in electrical development. The 2,000,000, or, as some claim, 3,000,000 horse-power available in the streams that flow from the Appalachians to the Atlantic, when developed, would mean an investment in hydro-electric plants of upwards of from \$200,000,000 to \$300,000,000, earning annually from \$40,000,000 to \$60,000,000 at a conservative estimate, and saving the South on

its coal bill alone some \$15,000,000 to \$20,000,000.

FORESTRY ONLY A PART

Obviously, we do not advocate maintaining a forest cover on the entire watersheds of our rivers. Lands suitable to agriculture must be devoted to that purpose, but there should be better methods of farming which will prevent erosion and will utilize a larger amount of water through increased absorption of the soil and increased crop production. My plea for forestry is mainly in the mountain regions on those areas of no permanent value for farming and situated most critically for watershed protection.

The total forest area of the Carolinas and Georgia is estimated at present at 75,000,000 acres. North and South Carolina have each 19,000,000 acres, and Georgia 37,000,000 acres.

Not less than 30 per cent of this area, or about 25,000,000 acres, should be permanently kept in forest for the protection of the streams that rise in the Appalachians. Of this protective forest 9,000,000 acres should be in North Carolina, 6,000,000 acres in South Carolina, and 10,000,000 acres in Georgia. Within this area there are about 2,000,000 acres on critical watersheds that will be in need of reforestation.

Serious injury to the industrial development of the South can be prevented by adopting right measures now. The National Government has recognized the public character of the problem in an extensive purchase of forest lands on the headwaters of navigable rivers. The National Forest Reservation Commisssion has approved the purchase of 120,706 acres in North Carolina, at a total cost of \$924,589; of 23,-286 acres in South Carolina at a cost of \$128,157, and of 96,132 acres in Georgia at a cost of \$622,654. These Government forests, however, as you can readily see, will form only a very small portion of the forest area which must be protected. The work of Government purchase is confined to the protection of navigable rivers. A considerable number of States have made

a beginning to meet this problem. No State is doing its full duty in forestry. The Federal Government is giving assistance to the different States in the work of fire protection on the watersheds of navigable streams. Approximately \$100,000 a year is expended in giving such assistance. It is a requirement, however, that no money can be expended for this purpose unless the State has established a system of fire protection and is appropriating for the actual work of protecting those lands an amount equal to what the Federal Government is prepared to allot. It has been the earnest wish of the Forest Service that more of the Southern States could secure advantage of this Government aid.

CONTROL OF WATER RESOURCES

Without any question, the problem of control of our water resources is one of the most important problems of internal development of the country. In many instances, streams are becoming more irregular every year. In nearly every part of the country the use of water resources is becoming more and more intensive.

A good deal of work has already been done upon our rivers. One of the greatest needs today is that the different activities essential for permanent improvement of rivers be brought into correlation and be conducted in accordance with a comprehensive plan. There have been enthusiasts who have asserted that the protection of forests would be sufficient to control floods. In my opinion, those persons who assert that any one method will meet the situation are wrong. Conditions necessarily vary, the needs of the different streams neces-

sarily vary; but in any case a real control of stream flow can be secured only by a comprehensive plan which makes use of all the different influences which affect control of water, levees where these are necessary, reservoirs where these are necessary, the protection of forests at the headwaters of streams, etc.

It is as ridiculous for a forester to claim that reforestation alone would prevent floods and bring about improvement of the rivers as it is for an engineer to claim that levees and drainage by themselves can work permanent improvement in our rivers. The engineer and the forester must work hand in hand if our river system is to be converted from a source of danger and expense to one of the highest usefulness.

There are some engineers, and very prominent ones, in this country who claim that neither the construction of reservoirs nor forestation can have any effect whatever upon the navigation of the river. They claim that navigation can be effectively regulated by channel improvement only. Yet history all over the world and experience in our own country shows how futile this method is to bring about permanent improvement in our rivers. Regulation of flood waters by channel improvement has been so far the only method used in the attempt to control our rivers; and the results speak for themselves. In the older countries it was found out many years ago that improvement of navigation near the mouth of the river is merely a temporary expedient. If permanent improvement is to be accomplished work must begin up the stream, not down. Regulation must begin at the source. Floods must be prevented, not cured.

Importing Norfolk Island Pine

Ghent, Belgium, furnishes practically all of the potted specimens of the symmetrical Araucaria, or Norfolk island pine, used as an ornamental foliage house plant, in Europe and America. The United States imports at least 250,000 of these plants in 5 or 6 inch pots each year.

^{*} From an address before the Tri-State Water and Light Association, at Atlanta, Ga., April 16.

WHITE MOUNTAIN WINTER WORK

ORESTERS who have just returned from winter work in the White Mountains of New Hampshire report that, while some hardship is entailed, as much can be accomplished in the dead of winter as in summer.

In most of the Government's field services it is usually thought best to work in the north during the summer months and in the south during the winter, the idea being to do the work with the least difficulty. In appraising lands for purchase under the Weeks law for the eastern national forests, however, the Forest Service has had to disregard latitude and season because it was necessary to expedite the work in the north. During the past winter two camps of men have been estimating and valuing the forests which the Government contemplates purchasing on the slopes of the White Mountains.

Because of the softness of the constantly falling snow, the work was done mainly on snow shoes. At times the temperature has been around 20 degrees below zero for considerable periods, and the parties now in report some occasions when the thermometers registered nearly 40 degrees below. The crews were housed in winter camps like those of the lumberjacks, and in order to make full use of the short winter days they were out by daylight and did not return until dark. The work of the crews required continuous walking. Diameters of trees were measured and the number of logs estimated in all merchantable trees growing on parallel strips 4 yards wide and 40 rods apart. From these estimates the full amount of timber was calculated.

One man, the crew leader, used a compass to keep the men in the desired direction, mapped the country traversed, kept account of the distances covered as determined by actual measurement, and recorded all the information regarding timber. The other members of the crew measured the timber and gave their figures to the leader, who tallied The actual work, however, did them. not end with all-day climbs through snow on the mountainsides, with frequent exposure to the sweep of winds on the higher ridges and divides; during the long winter evenings, or on days when the snow storms were so severe that outside work was impossible, the figures gathered were tabulated and the information grouped, so as to show the quantities of timber suitable for various products, such as saw timber, spruce for paper pulp, or birch for spool mak-During the whole winter, however, it was noted that stormy days caused no more loss of time than in summer, and the health of the men in the party was, as a rule, better than in hot weather.

It is said that the men became quite inured to the cold and liked it, one of the principal advantages being the absolute freedom from insects, such as gnats and mosquitoes. While these same crews might appreciate an assignment to the same region for the following summer, those who have the work in charge say it may be the lot of these same men to be assigned to the pine regions of the south during the hottest weather of August.

Indian Fire Patrolman

The Canadian government is using Indian fire patrolmen to protect the forests of northern Manitoba.

Walnut For Gun Stocks

A Pennsylvania gun company is using the waste pieces of black and Circassian walnut, left after veneer cutting, for gun stocks.

LODGEPOLE PINE FOR POLES

ODGEPOLE pine, of which there are abundant stands in both the Rocky Mountain and coast ranges, when treated with preservatives, ought to serve in the place of red cedar as a pole timber, says the Department of Agriculture in a bulletin just issued on Rocky Mountain woods

for telephone poles.

The rapid extension of telephone and power lines in the west is making the question of pole supply one of increasing importance. Western red cedar, for long the standard pole timber of the western States, grows only in Washington, Oregon and northern Idaho, and in the States south of that region its cost is high, owing to the great distance over which it must be transported. In addition, the heavy drain on the supply promises to result in increasingly higher prices.

The tendency of the lodgepole pine to decay rapidly when in contact with the ground, has so far kept it out of the field as a competitor of the cedar, according to the department, but the general adoption of preservative treatment by railroad and telephone companies changes the situation. At an additional cost for treatment that still leaves the pine pole the cheaper of the two in most markets outside the cedar

region, states the department; the pine may be made to last longer than untreated cedar. Tests carried on at the forest service laboratory also showed lodgepole pine to be as strong as the cedar, if not actually stronger.

Fire-killed lodgepole pine, of which there is a vast quantity in the Rocky Mountain region, showed a strength under test 80% that of live red cedar. In elastic values, the two were practically equal, and in stiffness, fire-killed lodgepole pine is quite comparable to the cedar. The prejudice against the use of fire-killed material is a mistaken one, says the department, for there is no inherent difference in wood seasoned on the stump and wood cut when green and then seasoned. On many areas such material remains entirely sound for a number of years after the fire which killed it, and besides is thoroughly seasoned and thus ready for preservative treatment as soon as cut.

Engelmann spruce is another Rocky Mountain tree which the department suggests might be used for poles. It is not as strong as lodgepole pine, nor does it take preservative treatment as well, but it grows farther south, and in many districts is the only local timber

available for pole use.

No Forest Fires In Ten Years

The tenth successive year without a forest fire has just been passed by the Powell national forest in south central Utah.

The Poplar's Growth

Yellow poplar, or tulip tree, the largest broadleaf tree in America, has been known to reach nearly 200 feet in height and 10 feet in diameter.

Pennsylvania's Timber Holdings

Pennsylvania has about 7½ million acres of timberland, one-eighth of which is owned by the State. The total value of the State's timber is 139 million dollars.

Montana's Highest Mountain

The highest mountain in Montana, Granite Peak, with an altitude of nearly 13,000 feet, is in the Beartooth National Forest.







EDITORIAL

IFTEEN States are without laws providing for a State Forest These fifteen administration. States are lacking in one of the most important measures a State can take for the prosperity, the comfort, the health and the recreation of its citizens. Without the organized care and development of the forests and the woodlands of these States which an efficient State forest administration would assure, their forests and woodlands are deteriorating, there is wasteful use of their timber; lack of proper fire protection and an absence of the popular instruction in care of forests, woodlands and trees which it is part of the duty of State forest administrations to give to the people.

A short time ago the American Forestry Association sent representatives into Virginia and urged the people there to demand, and the members of the legislature to pass, a forestry law. Such a law was passed. It will go into effect on June 1. It is not extravagant to claim that this law will result in saving to the State millions of dollars yearly as well as conserving the trees of the State, in forest, woodland and community, and thereby adding greatly to the beauty of the land and the health and the pleasure of the people.

The States in which there is no law providing for a State forest administration are: South Carolina, Georgia, Florida, Mississippi, Texas, Arkansas, Missouri, Illinois, Nebraska, Wyoming, Utah, Nevada, Arizona, New Mexico, and Oklahoma.

The American Forestry Association is about to commence in each of these States a campaign for securing forestry laws. The people will be told what such forestry laws mean to them, and they will be asked to urge the members of their legislatures to give serious consideration to the advisability of passing such laws. The Virginia Senate voted unanimously for the Virginia law, and the House passed it by a vote of 86 to 3. No member of a legislature having at heart the interests of his constituents can ignore the necessity for a forestry law, whether his constituents live in a dense forest, on land from which timber has been cut, or on land where timber never grew.

EMAND for forest conservation in Texas is so great that the movement to secure a State forestry department and a State forester has been endorsed in vigorous resolutions by the Houston Lumbermen's Club and the Lumbermen's Association of Texas. Officials of these two powerful organizations are determined to use every energy to further the agitation for a forestry law. They will dwell particularly on the importance of fire protection. Last year was one of the best seed years for longleaf pine known in the State. As a result of Nature's wide distribution of the seed and favorable weather conditions, thousands of acres of long-leaf

pine forests are now carpeted with these little seedlings, and it is most important that they be protected from fire.

It is highly gratifying to know that the lumbermen of Texas are so wideawake and progressive that they realize the advantage of forest conservation to such a degree that they are willing to give carefully planned effort to achieve it. Texas is one of the fifteen States which still are behind the times as far as the preservation and the protection of her forests is concerned.

EED of protection against forest fires is impressively apparent upon reading in the New York City Globe of April 15 that on the day before there were three forest fires in New York City.

One fire licked up a 200 by 200 foot patch of trees and underbrush on the grounds of the House of Mercy at Inwood-on-the-Hudson. Another swept through 100 acres of woodland on the west side of Emerson Hill, Staten Island. The third threatened the village of Egbertville, Staten Island.

If such fires can occur and do damage in the largest city in the United States, what may not be done by forest fires in the depths of forests hundreds of miles from any habitation? Who says that there is not need of forest fire prevention?

ITTING tribute was paid at Harrisburg, Pa., on May 4 to Dr. J. T. Rothrock, one of the most enthusiastic and able promoters of forestry in the United States, the occasion being his retirement from service in the Pennsylvania Forestry Commission, of which he had been an active member since its formation. His numerous friends and admirers, wishing to show their appreciation of his many years' devotion to the cause of forestry and the highly important results of his enthusiastic work, tendered him a luncheon and presented him with a testimonial cup. Dr. Rothrock in 1886 became secretary of the Pennsylvania

State Forestry Association, and from that day to this has given energy and his devotion to the cause of forestry. He was the first State Forest Commissioner for Pennsylvania, was for many years a member of the State Forestry Reservation Commission, and has also been for many years a vice-president and a most valued member of the American Forestry Association. Dr. Rothrock is esteemed not only in Pennsylvania but throughout the United States as a teacher and a leader in the cause of forest conservation, and not only those who attended the dinner but thousands of others sent to him expression of their appreciation of his splendid work.

OR the next decade in this country lumbering and wood utilization will be more important phases of forestry than reforestation or the reproduction of the forest. The forester must know how to get his products out of the forest and to the market not only in the cheapest way but in a way that will leave the forest in the best condition for the production of a future crop. After

the logs are out of the woods the forester must understand how to utilize the lumber produced so as to make the largest profit. Statistics show that today less than 50 per cent of the raw products of our forests are actually utilized, and the problem of more complete utilization is being taken up not only by the forester but by lumbermen and wood users throughout the country.



FOREST NOTES

During March twenty-five forest fires burned on or near the land in the southern Appalachians, which the Government is securing under the Weeks law for the establishment of national forests. Seven of these fires reported by the Government's forest officers covered more than 10 acres, but 11 were less than one-quarter of an acre in size.

The most common cause was railroad sparks. On what are known as the Cherokee, Mt. Mitchell, Unaka, and White Top areas the railroads cross lands which the Government is acquiring, so that there is considerable risk, even though the rights of way are patrolled during very dry seasons. The State laws, however, are so lax in regard to the maintenance of spark arresters and keeping the railroad rights of way clear of inflammable material that, the foresters estimate, more than half of the total number of fires occurring during March were probably set by railroad locomotives.

Six out of the 14 areas in which the Government is purchasing lands reported fires during March. Except for the White Top area, which is on the border line between Virginia and Tennessee, all the areas from which fires were reported are in North Carolina, South Carolina, Tennessee, and Georgia.

An investigation to determine the advisability of growing basket willows in the low-lying lands along the South Carolina coast has recently been started

through cooperation between Clemson Agricultural College, the office of Farmers' Cooperative Demonstration Work, and the Forest Service of the United States Department of Agriculture.

Much of the low-lying land in this region has previously been used for the production of rice, but several factors, including the development of new rice areas in the Gulf States, have made rice growing unprofitable and a new crop for the land is being sought. Basket willows at once suggested themselves as a possibility, and the present investigation is being conducted to determine to what extent they can be successfully grown on lands of this character. The soil is a rich, black muck, and the continuous production of good crops of rice for years with little or no fertilizer indicates its richness.

Wood is extensively used for fuel in the Black Hills region. During the past year the Forest Service at Deadwood, S. D., issued 500 permits authorizing the removal by settlers and homesteaders of 6,000 cords of wood for fuel purposes.

A reconnaissance survey of the plant life of New York State is being carried on by Dr. William L. Bray. Dr. Bray is in charge of the botanical instruction in both the University and the State College of Forestry, and as he has been granted a leave of absence for a year, he will spend this year in resuming a

line of work which he pursued with distinction in the Southwest, namely, in his studies of the vegetation of Texas published in a series of bulletins by the United States Forest Service and the University of Texas.

In the study of the wood-using industries of New York which was carried on by the United States Forest Service and the New York State College of Forestry and which resulted in a comprehensive report, it was seen on every hand that there is great need of a broader reconnaissance survey of the forests of the State. Such a survey of the plant life of the State will furnish a background and a basis upon which the progress of research will stand out in clear proportions. Such surveys of life conditions within a limited area or within a State have come to be regarded as essential in the working out of any policy of conservation of natural resources.

Striking features of the economic crisis which the lumbering interests of this country are now facing are brought to light in the announcement that at the request of prominent lumber interests a two years' course in the business of lumbering is to be given next year by the Harvard Graduate School of Business Administration, in cooperation with the Harvard Forestry School.

It has been discovered that forestry education, after the German pattern, does not meet the needs of the lumbering interests. It is good and necessary, the lumbermen admit, to know how to protect existing tree growth, and to start new growths. But the present and acute problem is how to manufacture the existing trees into lumber and to sell the lumber at a profit. The Federal Government itself is struggling with this problem in its attempts to dispose of lumber from the public reserves.

John M. Gries, of the United States Bureau of Corporations, has been appointed by the Harvard Corporation to give the new course so far as it deals directly with lumbering.

The directors of the Pocono Protective Fire Association recently gave

a dinner to the fire wardens of Monroe County, Pa. It was the first affair of its kind in Pennsylvania, and was given by the directors of the Association to mark the inauguration of a new provision of the law which places fire wardens under the direct supervision of a State forester in counties where the Commissioner of Forestry thinks it advisable to make such appointments. The Association asked for a district forester for Monroe County and John L. Strobeck was selected. The forest fire protective service there has been reorganized and much higher efficiency in the work is expected this season.

Representative Denver S. Church, of California, has introduced a bill by which the Secretary of the Interior is empowered, upon recommendation of the National Forest Reservation Commission, to exchange United States lands now a part of the Sierra National Forest for privately owned timber lands lying within the boundaries of Sierra National Forest and the Yosemite National Park, lands thus acquired by the United States within the boundaries of the Sierra Forest and of the Yosemite National Park to become a part of each park respectively.

Secretary George H. Rhodes, of the California Forest Protective Association, contributed to the California Arbor Day Manual for 1914 outlines for compositions, speeches, declamations, essays and orations for the public school children, which will be a great help in teaching them what all children should know about the forests and inspiring not only a love of trees but a realization of the needs of proper care of the forests. The Association followed this up at the suggestion of the State Superintendent of Public Instruction with a letter to school teachers in the timbered districts calling their attention to the outline in the Manual and offering to help them in every way.

Congressman French, of Idaho, has introduced a bill in the House providing for the appropriation of not more than \$15,000 of the receipts from the national forests in any State, for the

forest schools of the same State. Many of the forest schools could increase considerably their facilities for educating forest students if they received each year the additional aid which such an appropriation would give, and the heads of a number of these schools have already expressed the hope that the bill will pass.

According to the third annual report of F. A. Elliott, State Forester of Oregon, the fire patrol law has proved a powerful help in advancing systematic forest fire protection. He said it was the chief factor in more than doubling the membership of the patrol associations organized in 1911 and 1912, and besides six new associations were formed last spring.

During the year 1913 there were 383 forest fires on privately owned land and 387 in the national forests in this State, but so effective were the organized forest fire fighting associations that comparatively small damage was done.

More damage was caused by fires

originating in slashings than from fires of all other classes, according to the

report.

The sandy tip of Cape Cod, which is constantly shifting under the influence of wind and tide, is to be anchored by reforesting, according to an arrangement announced by the State Harbor and Land Commission and the State Forestry Department of Massachusetts. The lands are known as the Province lands.

Thousands of trees of a type that will not only give stability to the soil but defy the ravages of the gypsy and other moths will be planted this spring.

Timberland owners of Harlan County, Kentucky, have organized the Harlan County Forest Protective Association and the members so far enrolled represent about 200,000 acres. The members are being assessed one-quarter of a cent an acre with provision for additional assessments up to but not exceeding one cent an acre if needed. State Forester Barton will cooperate with the Association and will divide equally all fire fighting expenses. The forest fires have been a serious loss and yearly menace to the forests of Harlan County, and the Association was badly needed.

STATE NEWS

Georgia

Head Forester Graves spent the 14th of April at Athens as the guest of the University of Georgia. He addressed the students at the Chapel in the morning. In the evening he attended a banquet given by the Forest Club, and talked in an informal way.

Mr. Graves went to Atlanta from Athens,

Mr. Graves went to Atlanta from Athens, to attend the convention of the Tri-State Water and Light Association on the 16th

and 17th.

Representatives of the Morse Land and Lumber Company, the Byrd-Mathews Company, and the Pfister & Vogel Company met at Helen the latter part of March and conferred as to the prevention of forest fires on their holdings.

Maine

That enormous damage has been wrought to the spruce, fir, larch, hemlock and white

pine trees of Maine forests during the past year is stated in the annual report of Albert K. Gardner, State horticulturist, filed with the Governor. Mr. Gardner says:

"The increase in numbers of the spruce bud worm during the past three years has given just cause for alarm among owners of spruce, fir, larch, hemlock and white pine. We are constantly receiving letters from wild land owners, and owners of summer camps who are dependent upon the beauty of their trees for a large part of their summer business, telling of the enormous damage being done to the trees by this most serious pest. Many islands along the coast seem to offer particular inducements to the insect, and here we find them especially abundant. During the latter part of the past season, parasites in the form of spiders have accomplished a great deal in controlling them, and it is to be hoped that in another year we will find that they have been more or less exterminated."

South Dakota

The season of 1914 in South Dakota opens with a promise of a considerable activity on the State Forests. The fire season normally opens during the middle of April and con-tinues through October. The fire plan inaugurated in 1913 will be continued with some improvement during the present season. operation of this plan in conjunction with the plan of the adjoining Harney National Forest and in cooperation with Federal assistance under the Weeks' Law should furnish effectual protection to the State's forest lands.

Owing to the burning of the plant of the Lanphere-Hinrichs Lumber Company at Rapid City in January, logging operations on the forest were at a standstill for some time, excepting for the operations of three or four small portable mills. However, it is expected that the new mill of the company will be in operation again by June 1, when cutting will be resumed on the State tract on Rapid Creek.

The Game-Fence, enclosing 61,000 acres of the Custer Forest as a game preserve, will be completed this season and ready for the game to be purchased by the Game Commission. The erection of this fence was "wished on" the Department of School and Public Lands by the last Legislature, and its construction has been in charge of the State Forest Serv-Already a carload of elk from the Jackson's Hole country has been received at the preserve, and are confined in a special corral of one mile square constructed in February on Squaw Creek. A loss of three occurred in shipping, but the balance of the herd seem to be in good condition and perfectly at home on the forest.

Owing to late rains last fall and some early spring moisture, grazing conditions appear to be normal for the spring months.

Michigan

In order to encourage private owners in the reforestation of their waste lands, the Public Domain Commission has in the past offered planting stock from its forest nursery at Higgins Lake to the people of the State at very low figures. The same policy will be pursued this year. Among the species listed for sale are both seedlings and transplants of white pine, Western yellow pine, Scotch pine, Lodgepole pine, white spruce, blue spruce, Norway spruce, red spruce, and Douglas fir. The prices range from \$2.00 per thousand for seedlings two years old to \$8.00 per thousand for transplants of large size, which include packing, crating, and delivery to the railroad station. Plants are not sold in lots of less than 500. Many orders for spring delivery have already been received, and the indications are that the demand for planting stock this season will show a marked increase over that of former years.

The area of State lands reforested each

year is gradually increasing. More than half

a million trees will be planted on the Higgins, Houghton, and Fife Lake Forests this spring. White and Norway pine are used almost altogether in this work, although experiments are being conducted on a small scale with such species as Austrian and Scotch pine, European larch, and Norway spruce.

California

California observed Fire Prevention Day on April 18 with gratifying success. State Forester Homans, for the State Board of Forestry, had 135,000 pamphlets distributed to the school children of the State. told of the damage done by forest fires, gave instruction on how to prevent and how to fight them, and carried also valuable suggestions to teachers for continuing this course of instruction during the year. This course of instruction during the year. sort of educational work is having a decidedly good effect.

Minnesota

State Forester Wm. T. Cox's third annual report as State Forester of Minnesota is just out, and, as might be expected, goes into most interesting detail as to the work of his department during the year. He says that fire prevention was the chief task of the service during 1913 and that considerable attention was also given to obtaining more accurate information regarding the forest resources and of educating the public to a proper appreciation of the forest problem. Mr. Cox says he believes that as the majority of the people of Minnesota realize the condition of the forests, the importance of the industries which they sustain, and the business necessity of properly caring for the woods that the tremendous handicap under which the forest service is laboring will be removed and sufficient funds provided to carry on the work. With this in view much effort was given in 1913 towards reaching the public both through meetings and through the press.

New Hampshire

The Connecticut Valley Lumber Company, under the joint management of Stone & Webster and Hornblower & Weeks, with tensive timberland holdings in northern New Hampshire and Vermont, has closed a con-tract with the Berlin Mills Company, of Portland, Me., and Berlin, N. H., covering the sale of all softwood timber situated on the Androscoggin slope. It is estimated that about 500,000,000 feet of timber is affected.

This is a tract of about 45,000 acres of virgin territory never before operated, the Connecticut Valley Lumber Company having confined its operations to the Connecticut slope, where it owns approximately 260,-000 acres with a softwood stumpage of about

1.500,000,000 feet.







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